FARMERS DIGEST

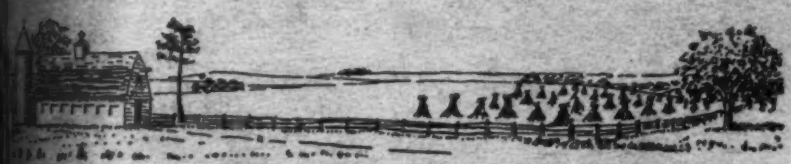
JUNE, 1943

Volume 7
Number 2

25¢ a Copy
$2.00 a Year

LIBRARY
CURRENT SERIAL RECORD
MAY 29 1943
U.S. DEPARTMENT OF AGRICULTURE

The Right Time to Make Hay	*Successful Farming*	1
Ten Farms Doubled Production	*Missouri Ruralist*	5
Efficient Milking	*Ayrshire Digest*	8
Our Soils in Selected Service	*William A. Albrecht*	15
Early Breeding of Animals	*California Cultivator*	20
How Cured Hay	*Electricity on the Farm*	22
Forty Million Pounds of Nitrogen	*Pennsylvania Farmer*	27
Lambing Time	*Eastern Breeder*	32
Modern Management for Missing the Moult	*Pacific Poultryman*	35
Watch Out for Cholera	*The Furrow*	37
Clods Are Robbers	*Wallaces' Farmer*	40
Family-Size Fruit Trees	*Capper's Farmer*	43
Using Horses and Mules Efficiently	*The Horse*	46
Ketosis in Dairy Cattle	*Jersey Bulletin*	49
Chickens Pay Their Way	*Farm Journal and Farmer's Wife*	54
Soil Loss Secrets Revealed	*The Farmer*	56
Prevent Colds and Shipping Fever	*Kansas Stockman*	58
Milkweed: Industry's New Baby	*Nation's Business*	60
Thin, Weedy Pastures Need Attention	*Farmer's Magazine*	62
Solving the Machinery Shortage	*Western Farm Life*	64
Give Them Better Grass	*Everybodys Poultry Magazine*	66
Preparing Rabbit Meat for the Table	*New Jersey Agriculture*	70
Emergency Feeding Hints	*Guernsey Breeders' Journal*	72
Meeting the Protein Shortage	*Farm Research*	77
Earlier Marketing of Range Cows	*The Cattleman*	80
For the Farmer's Library		86



The Farmer's Digest

EDITORIAL STAFF:

Editor—L. Bush-Brown Assistant Editor—C. Leavitt Dyer

Business Manager—A. E. Heick

Associate Editors—
John A. Andrew, Jr., James Bush-Brown, Ruth Patrick

ADVISORY EDITORIAL STAFF:

William A. Albrecht
Chairman, Department of Soils
University of Missouri

John D. Beck
Professor of Veterinary Medicine
University of Pennsylvania

Hugh H. Bennett
Chief, U. S. Soil Conservation Service

D. B. Johnstone-Wallace
Assistant Professor, Department of Agronomy
Cornell University

H. J. Reed
Dean of the College of Agriculture
Director of the Experiment Station
Purdue University

W. T. Spanton
Chief, Agricultural Education Service
U. S. Office of Education

Howard B. Sprague
New Jersey Agricultural Experiment Station

M. L. Wilson
Director of Extension Work
United States Department of Agriculture

The Farmer's Digest

Published Monthly at Ambler, Pennsylvania
by the Farmer's Digest, Inc.

25c a Copy *1 Year $2.00*

2 Years $3.50 *3 Years $5.00*

Foreign and Canadian Subscripions $2.50 a Year

Entered as second-class matter at the Post Office at Ambler, Pa.,
May 5, 1937, under act of March 3, 1879

I

The Farmer's Digest

Volume 7 June, 1943 Number 2

The Right Time to Make Hay

Condensed from Successful Farming

C. J. Willard

Ohio Agricultural Experiment Station

IN the old days of sky-squinting and rain-dodging there was a definite season for haying which was as much a habit of the old-timers as the family picnic on the Fourth of July. There just wasn't any denying it; the right time to make hay was the last week in June.

Just when the hay-time habit was getting firmly set in the lore of agriculture, along came the results of a series of tests which inescapably showed the best time to cut red clover, alfalfa, and various other legume hays is early—around the *first* week of June—if we are to get maximum yields of protein. Everyone knows, of course, that protein is what we're after in this wartime year. Incidentally, the tests blasted another legend: that alfalfa was the top-notcher in digestible protein yield. The facts of the case are that when red clover and alfalfa are cut early and on the same day, the average protein difference between them is less than one per-cent!

More practical were the findings that proved every acre of red clover stored before June 15 (instead of the traditional June 30) saved an amount of protein equal to that contained in 200 pounds of soybean meal. That's no small saving. The chart below, representing the results of four years' tests in northwestern Ohio (they apply to northern and central Indiana, Illinois, and Iowa as well), will give a conclusive picture of the need for early cutting in 1943. Yield and percentage charts for alfalfa are almost identical. Clover-timothy mixtures should be cut when the timothy is well headed—only about a week later than the dates shown for clover alone.

A further argument is that the digestibility of clover and other forages decreases greatly with late cutting. Recent experiments at the Vermont Station found the digestibility of the protein in early-cut clover-timothy hay to be 58 percent and in late-cut, 27 percent.

Reprinted by permission from Successful Farming, Des Moines, Iowa, May, 1943

Furthermore, the most seed in the second crop of medium red clover is obtained when the first cutting is made before June 15. As a five-year average, the Ohio Experiment Station obtained only half as much seed in the second crop when the first cutting was made in late June as when it was made before June 15. This is a vital matter this year, since serious shortages of red clover seed will develop if we have a short seed crop in 1943.

With the shortage of help, haying may be spread over a longer period than usual. By starting early, even before June 1 if good days permit, we can spread haying out and still harvest good average-quality hay. If we wait until the usual time to start, we will be harvesting only "cordwood" when we finish.

After all, it's easy to say *when* legumes should be cut for high protein, but how is a man to store them once they're cut? There are reasons that it is harder to cure early-cut hay. Early-cut hay contains five to six percent more moisture than late-cut, but requires only two or three hours more to dry. The average temperature is about 10 degrees lower, and the average humidity, somewhat higher in early June than in late June. Perhaps the most important difficulty is that since early-cut hay is high in feeding value, molds and rots attack it quickly, and consequently wet weather does more harm more quickly to early-cut hay. "Cordwood" hay is not easily damaged.

One of the best ways to preserve early-cut forage is to make it into silage. Putting early-cut forage in the silo stores high-protein feed with less loss than any other method of handling. Shortage of materials may keep us from building new silos this year, but we can make use of those that are built. Since both molasses and phosphoric acid are difficult to obtain, either 200 to 250 pounds per ton of corn-and-cob meal, or wilting to 68 percent moisture should be used to preserve the silage.

An important hay-saving suggestion of recent years is the plan, originally suggested by TVA, of blowing unheated air thru tough hay in the mow from permanent ducts on the mow floor. Even in poor drying weather it is not difficult to dry hay in the field down to 35 to 50 percent moisture, but this is 10 to 20 percent too much water for safe storage. The TVA plan removes this last 10 to 20 percent of moisture.

This system is installed in two barns on the Ohio State University farm. In June, 1942, at Columbus, there was rain on 19 days, and only once during the month were there three consecutive days without rain, yet about 180 tons of tough hay containing

35 to 45 percent moisture were put in these two barns in June and cured into good hay—the only good first-cutting hay we harvested last year.

A description of this system can be obtained from the Department of Agricultural Engineering, Ohio State University. The ducts can be built out of rough or salvaged material. The most critical shortage in using this method this year is fans. Silage-cutter fans do not work satisfactorily.

Even without forced air, any sort of ventilator placed in a mow or stack and connected with the outside air will reduce or prevent spoilage. An open, wood-frame chimney placed in the center of a stack has made possible stacking of hay containing at least five percent more moisture than would have been safe otherwise. Similar chimneys may be placed in mows. The ends of the cross-pieces in these chimneys should project slightly in order to make openings in the hay as it settles around the chimney.

Chopping hay into the mow saves much hot, hard labor, puts twice the hay in the same storage space, and leaves the hay in shape for easy handling and feeding later. Field choppers which can be used for corn silage and grass silage, as well as the hay harvest, promise a major revolution in forage harvesting as soon as priorities permit their more extensive building and sale. In an Ohio survey, such outfits put in hay with fewer man-hours of labor than any other. A chopper supplied by a buck rake permits rapid handling with a small crew.

Chopped hay must be drier than long hay, or it will heat badly, with corresponding loss of carotene and danger of spontaneous combustion. Chopped hay should be cut longer. Four to six inches is most desirable, which means setting the cutter for a 1¾- to 2-inch cut. Ventilators of any kind in chopped hay reduce the heating but may cause more white mold.

Because of the difficulty in getting first-cutting hay dry enough for mow storage as chopped hay, many farmers are stacking chopped hay in the field, blowing it into a snow-fence form which is raised as the stack is built. Such a stack saves a lot of labor, and the hay cures better than when in the mow. Furthermore, a man is not needed on such a stack.

Often farmers wait until the dew is off before starting the mower. Time can be saved by cutting hay early in the morning. Tests show that hay cut after the dew is off is seldom drier or better when raked than hay cut the same day when the dew is on.

Buck or sweep rakes, mounted on old auto chassis or tractors, have been the farmers' own answer to labor shortages in the

hayfield. No other method saves more haying time. On 137 Ohio farms, buck rakes got in hay in less than two man-hours per ton of hay harvested, while wagons and hay loaders required over three. Detailed plans and directions for making these rakes can be obtained from the Department of Agricultural Engineering, Ohio State University, Columbus, Ohio. (These will be sent to addresses outside Ohio for 10 cents.)

Smaller crews can do the haying with buck rakes. A man can even work by himself, and two-man crews are not uncommon. Slings are preferred to forks to get the hay into the mow. Length of haul up to a half mile did not greatly affect the cost of using buck rakes. Within that range the cost per ton increased five cents for each 40 rods of travel with auto rakes and 10 cents per 40 rods with tractor rakes. "Double-loading"—making a load, putting another on the first, and then taking both in—saves much time on long hauls.

The pickup baler has gained amazing popularity in the last five years. It requires more man-labor per ton than the buck rake to get the hay in the barn, but the hay is in compact, salable form, and can be stored in small space. If the hay is allowed to dry below 23 percent moisture before baling, better hay is produced in this way than by ordinary methods, because more leaves are saved. On the other hand, it is easy in these rush days to take a chance and bale hay containing too much moisture.

It's obvious, then, that moisture control is vital in all hay and silage making. In general, trained judgment is still the only rapid method of estimating moisture in hay, but a quick, simple, accurate moisture test, invented by R. Q. Parks of the Department of Agronomy, Ohio State University, has recently been put on the market. For silage, the Bureau of Dairy Industry, United States Department of Agriculture, has recently developed a quick home-made test for finding if forage has dried enough to be stored as silage.

The Editors of the Farmers Digest regret that an error was made in the May issue, the article "Nicking in Dairy Cattle Breeding" being credited to the Ayrshire Digest, whereas credit should have been given to the American Dairyman.

Ten Farms Doubled Production with Less Help

Condensed from Missouri Ruralist

Cordell Tindall

TEN Warren county farmers have doubled production on their farms in the last several years, despite a loss of 10 workers, despite machinery and other shortages, despite all the problems that plague most of us today.

This amazing record has come about by their adoption of a system of management known simply as "Balanced Farming." Actual figures plainly show that these farms are producing "more with less."

"Balanced farming" is a term originated by authorities of the Missouri Agricultural Extension Service and introduced to the group of Warren county farmers thru Dorris Brown, capable county agent. There is no magic in this system. The term merely is used to describe an "all-out" farm management plan in which all the many operations necessary in farming are pieced together in one picture of good practices.

Emphasis was not placed on pork, or beef, or dairy, or soil conservation—all of these things were considered together to set up on each farm enterprises that would be the most productive. All over the state other Missouri farmers are doing the same thing.

Since 1939 these 10 farms have shown increases of 77 per cent in beef marketed, 121 per cent in hogs marketed, 507 per cent in lambs, 95 per cent in pounds of butterfat, 19 per cent in eggs.

Last year the 10 farms produced 219,700 pounds of meat while in 1939 they produced only 104,900 pounds. In 1942, butterfat production was 16,842 pounds while in 1939 it was 8,605. The increase in eggs was from 17,920 dozen to 21,382 dozen.

What are these Warren county men doing that other farmers can't do? To find out we visited more than half of these Warren county farms with County Agent Brown and Albert Hagan, Extension specialist in farm management.

The farms on which these records have been made belong to M. F. Drunert, R. T. Eversmeyer, Walter Rottman, H. H. Schmidt, C. H. Wegener, M. F. Winter, Ervin Wulff, Warner

Reprinted by permission from the Missouri Ruralist, March 27, 1943

Wulff, W. H. Wulff and Herbert Kettler.

None of the farms are "superfarms." They range about medium in fertility, with some of them being considered worn out a few years ago. In a frank evaluation of these farms, they would scarcely rank as average in natural fertility thruout the state. But thru conservation practices and good management they are more productive than many a more fertile farm.

What was done on these farms? We list here briefly some of the most common practices.

All-year pastures for livestock with sweet clover, lespedeza, barley, wheat, rye and other crops used on nearly every farm.

Most of the land has been limed and terraced and 150 to 200 pounds of fertilizer applied to insure a good crop. An average of 150 tons of lime to the farm has been spread, an average of 6 tons of fertilizer to the farm used, and an average of 1 mile of terraces have been built. This has meant more legumes for pasture and feed, a higher mineral, vitamin and protein content in the feed grown, and increased yields all around.

To best utilize the higher yields of food more livestock was produced. The soil-building program raised the livestock capacity of each farm.

Improved practices with livestock increased total production on the farms. Of the group, 7 of the men raised their pigs on clean ground. Many movable hog houses were built this winter. We found these out on small grain pastures in several cases. From birth, hogs are fed a balanced ration with wheat being a major hog feed. Vaccination is another common practice.

With feed cattle, 9 of the 10 farms used a purebred sire. Several years ago only 1 purebred could be found. Year-around pasture means more feed with less labor.

A similar program is followed by the dairymen, with all-year pasture, legume hays, lime and fertilizer all making more and better feed. Purebred sires are used, too.

The poultrymen raise all their pullets on clean ground and vaccinate for chickenpox.

Certainly none of these practices are out of reach of any farmer.

One of the surprising things about the records of the Warren county men is that more was produced with less labor, for during the last few years 5 sons and hired hands and 5 daughters on the 10 farms have gone elsewhere.

We are too likely to think of labor-saving devices as gadgets. Pasture farming is the greatest labor-saver of them all. Systems of farming can be devised to cut

down on necessary labor, at the same time actually increasing production. The saving in labor and the increased feed production is used to obtain big increases in livestock.

In the case of these Warren county producers increases in production were not always in a ratio with increases in numbers. In other words, thru better practices a small increase in dairy cattle, for instance, meant a great deal more milk.

The 10 men increased their cows by 33.3 per cent but increases in butterfat were 95 per cent. Waldo Wulff, one of the good dairymen, had 10 cows to begin with that produced 2,000 pounds of butterfat a year. Last year he had 20 cows, but they produced 6,100 pounds of butterfat. Twice as many cows produced more than 3 times as much butterfat. Average production to the cow went from 205 pounds a year to 301 pounds.

Why did Mr. Wulff's cows do so much better? Maybe his soil conservation record will help tell us. An early liming program may have helped. A total of 18,000 feet of terraces built might be one reason. The fact that all crops were contoured probably did some good. Pastures of lespedeza, sweet clover and barley and rye certainly meant more feed, as did lespedeza and soybean hay.

Careful culling of heifers and the selection of good bulls raised the production average. Heating drinking water in extreme cold weather was just a detail, but an important one.

When it came to raising pigs the group did a much improved job. In 1939, their 28 sows raised 270 pigs. In 1942, their 54 sows raised 598 pigs. With a 93 per cent increase in sows the men got a 121 per cent increase in hogs that went to market. This meant that instead of saving 9 pigs to the litter, which is pretty good, they were saving 11 pigs.

The same was true of other enterprises. A 15 per cent increase in chickens brought a 19 per cent increase in eggs. A 66 per cent increase in beef cows brought a 77 per cent increase in beef sold.

As we went from farm to farm, seeing well-kept buildings, good-type terraces, hogs on clean ground, approved-type laying houses and range shelters, good purebred sires, lots of good legume hay in the barn lofts, we began to visualize more and more what such things mean today in terms of more food for our fighting forces and for our nation.

Efficient Milking

Condensed from The Ayrshire Digest

Dr. W. E. Petersen
University of Minnesota

FOR satisfactory milk production, the udder must not only be well developed and have a good capacity for secreting milk but the milk must be gotten out of the udder. This latter phase has not been understood until within the last two or three years, even though good dairymen have generally recognized that the way in which a cow is milked affects milk production.

Everyone who has milked cows knows that under various conditions the expected amount of milk is not obtained. Such failures have been variously explained. Some explain the phenomenon by believing the cow "held up" her milk and others, believing that most of the milk is secreted during the milk process, explained the situation by saying the cow did not secrete the milk. Both of these viewpoints are wrong.

Although there are many good milkers who know nothing about the fundamentals of milk secretion, such knowledge will help materially in an appreciation of what must be done for effective milking. Of the more important concepts that one should have are: (a) the time when milk is secreted; (b) where the milk is stored; (c) the smallness of the structures in which milk is stored; (d) the mechanism responsible for the let down of milk; (e) factors that interfere with response to the milking act; (f) factors that facilitate response to milking.

The first important concept that one should have is that all of the milk obtained at a milking is present in the udder when the milking begins. This has been demonstrated by removing the udders from cows at milking time and by analysis determining the amount of milk in them. *Therefore, the belief that a poor milking is due to a cow's failure to secrete the milk during the milking process is wrong.*

The second important concept to have is that most of the milk in the udder is stored in the tiny alveoli where it is secreted. Only a relatively small portion of the milk has drained into the larger ducts and milk cisterns before milking. Those who have milked cows by hand will realize how

Reprinted by permission from The Ayrshire Digest, Brandon, Vermont, April, 1943

little milk is present, in the larger ducts and cisterns. It is that amount obtained immediately after milking is begun before the "letdown" of milk occurs.

Thirdly, it is necessary to realize how small the alveoli are and that the milk cannot drain down from them by its own weight. Each alveolus contains but a small fraction of a drop of milk. The situation may be likened to an eye dropper filled with a fluid. Not until pressure is applied to the bulb will the fluid be forced out. The udder may just before milking, be looked upon as having millions of tiny eye dropper-like structures filled with milk. Tiny muscle cells are located around the alveoli which, when contracted, force the milk out. To cause contraction of these cells is a positive act requiring the cooperation of the cow. Thus when the cow fails to respond to the milking she does *not* "hold up" her milk; she simply fails to let it down.

In addition to a knowledge of the afore-mentioned facts it is essential to have a concept of the mechanism which brings about a letdown of milk. This mechanism is rather complicated—involving the nervous system, a hormone and the blood. The nerve endings involved are those in the skin of the teats and udder—presumably the touch nerves. The milking act is a stimulus which automatically sends a message up the central nervous system ultimately reaching the pituitary gland, located at the base of the brain. As a result of this stimulus the pituitary sends out a hormone known as oxytocin into the blood which carries it to the udder. Here the oxytocin causes the muscle cells to contract forcing the milk out of the alveoli.

That oxytocin is the hormone involved has been proved by a number of experiments. First injecting this hormone into the blood stream causes a letdown of the milk no matter how reluctant the cow may be to respond. Oxytocin is also active in the isolated perfused udder where injection into the artificial circulation causes a letdown of the milk. Final proof that the substance responsible for the let down of milk is in the blood was obtained in the perfused glands. When blood taken from cows that had been stimulated to let down their milk was perfused through the isolated udder, milk was let down, while blood from cows not stimulated to let down their milk had no effect.

That the nerves are involved was proved by experiments in which cows were anesthetized. In this condition cows failed to respond to the milking stimulus but complete let down of the milk was always obtained by injection of oxytocin.

From these facts it is obvious that the first problem in efficient milking is to get the cooperation of the cow. Although the phenomenon, known as a reflex act, is automatic there are many conditions that will interfère with a complete response to the milking stimulus. This fact can, perhaps, best be illustrated by citing the results of a number of experiments. When pain was applied by putting a cat on the back of a cow, inflated paper bags exploded at frequent intervals and a cage of rats placed in the manger, there was no let down of milk. In one experiment under these conditions the milking machine was left on for 42 minutes with no milk being obtained after drainage of the milk in the cisterns and layer ducts.

Placing grain in a position where it could be seen but not reached by cows when milked caused an incomplete response to the milking stimulus. The cow was more interested in obtaining the grain than in being milked. Other experiments in which cows were frightened or angered caused a completed failure of response to the milking act.

Cows vary greatly in the way they are affected by minor things. Some cows apparently want to be milked so much that they are affected only by such strong emotional states as fear and anger. Others are affected by anything that attracts their attention other than the job of being milked. Any strange sounds, objects or change in routine upsets a large number of cows to the extent that there may be a partial or complete failure in the response to the milking act.

For good milking it is essential that the cow must like to be milked and that there be no distractions during milking time. It is important in breaking in heifers to milking that they be treated in such a manner that they do not come to associate unpleasantness with milking.

While what has been said up to this point seems complex, there are still other factors that must be considered. Two very important considerations are the reasons why fast milking is essential and why cows must not be stimulated to let down their milk before milking.

It has been recognized for a long time that fast milking is essential but the reasons for this have not been clear until now. In some experiments when oxytocin was injected it was observed that if milking was delayed for some time after the injection, all of the milk was not obtained. This indicated that either the hormone is destroyed or loses its effectiveness shortly after it is secreted. To test the effect of delayed milking upon the amount of milk obtained, one quarter was milked at

a time followed by injection of oxytocin to get out all of the milk in the udder. It required 20 or more minutes to milk a cow by this procedure. There was a progressive decrease in the amount of milk obtained from each quarter milked—the fourth quarter producing but 75% of the milk expected and proven to be in the gland after the injection of oxytocin. From these experiments it became obvious that if much more than five minutes were taken in milking, all of the milk would not be obtained.

To test the effect of stimulating cows to let down their milk some time before milking began, the udders were washed and massaged, 20 minutes before the milking was begun. As a result the amount of milk obtained became very variable with sharp declines. For the larger milk producers there was as much as 20% decline in milk production in two weeks of this system of milking. These experiments show the importance of not stimulating cows to let down their milk until immediately before the milking begins.

In most herds there are cows that are so anxious to be milked that they will respond by a let down of their milk to anything that suggests milking. This may be the sound of the milking utensils or milking machines or any other factor that may be associated with milking. Such cows may be detected by the distention of the udders or if they are easy milkers by the running of milk from the teats. Cows that respond in this way should be milked first.

A question that logically arises at this point is: What is the effect of incomplete milking? If a cow fails to let down all of the milk at one milking, will it not come in the next milking? Answering the second question first, it is true that when there is an incomplete milking as a rule the following milking will be large and contain a large fat percentage and perhaps little, if any, harm is done. If, however, the incomplete milking is continued over a period of time, there will be a falling off in milk production, as a matter of fact the drying off process begins. When milk is left in the udder pressure is built up from the accumulation of the newly secreted milk and when this pressure is about one-fourth that of the blood pressure the secretion stops and a reverse process sets in. If this continues for any length of time, the secretory capacity declines and the drying off process begins. In my opinion many cows are so-called short timers because of continued incomplete milking. Experimental evidence for this opinion was found in two cases that were short timers because either they lacked the capacity to

respond to the milking stimulus or to secrete the hormone. After these cows were milked the hormone was injected and a large additional amount of milk was obtained. Confirmatory evidence comes also from many reports of slow and poor milkers drying up cows.

It is obvious that for good results, not only must the milkers be competent but the cows must be properly trained. This latter concept has received very little attention but is of great importance, particularly with machine milking. Not only can cows be trained to respond promptly to the milking stimulus, providing distractions are eliminated, but they can also be trained to become bad milkers.

Although there is still much to be learned about the best methods of training cows for milking, much of the fundamental knowledge needed is now at hand. Training begins with the first milking of a heifer. While it is fine for the calf to nurse its mother such a practice is probably not good for the milking habits of the heifer. Once a heifer becomes accustomed to the nursing of the calf it is more difficult to train her to milk by hand or machine. Leaving the calf with the dam a day or two may not be harmful. If the heifer is to be milked by machine she should be started out that way. A minute before the machine is put on the udder and the teats should be gently massaged to stimulate a let down of milk. The machine should be carefully put on so that she does not come to associate it with anything unpleasant. Another important point is not to leave the machine on more than four minutes and for a shorter time if the milk is all out before then. Many cows will milk out completely in three minutes. Do not strip following the milking machine unless the animal does not respond at all to the milking stimulus. One thing is certain, prolonged stripping will cause cows to become strippers. Even if all of the milk is not removed for the first few times, it is better to leave it in the udder than to strip and develop the habit. With relatively few exceptions, heifers properly treated will soon develop the habit of letting down completely without any stripping.

For older cows that have developed bad milking habits such as slow response to the milking stimulus and prolonged stripping, the problem is a little more difficult, although not hopeless. In the early part of the lactation period they may be trained with good success in the same manner as described for the heifers. When the training is postponed to later in the lactation the problem is more difficult and in some cases it is not advisable to attempt to

train them, but rather to wait until the next lactation.

By the proper training of cows milking by machine can be greatly speeded up. Many cows will be completely milked out in three minutes. When stripping following the machine is abandoned, one man can easily operate three or even four units. I have many reports where one man milks 50 or even more cows per hour after the cows have been properly trained. With this speeded up milking also comes the reports of increased milk production and lowered incidence of mastitis. Incidently, in my opinion, one of the most important predisposing factors for mastitis is injury to the teats and udder. Too strong hand milking and leaving the machine on after the milk flow ceases tends to injure the delicate lining of the inner teat and is thus a predisposing factor for mastitis.

There are many factors that interfere with a response to the milking process and certain essentials must be observed for efficient milking. Following are a number of rules that should be observed:

1. As a cow must like to be milked in order that there be a complete response to milking, it is of great importance that care be taken when a heifer is first milked that she does not come to associate unpleasant sensations with milking.
2. Avoid anything during milking that will attract the attention of the cow, such as strangers in the barn, strange dogs, strange noises or anything unusual, for such will prevent a complete response to milking.
3. Do not treat the cow roughly at any time, but particularly just before or during milking.
4. The milker must be one who does not arouse suspicion on the part of the cow. Some people by their actions create nervousness in cows and cannot be good milkers.
5. Avoid stimulating cows to let down their milk before milking is to begin such as washing or massaging the udders.
6. When cows are found that respond with a let down of milk to the starting of the milking machine, noises of the milking utensils or other factors incident to milking, such cows should be milked first.
7. Milk rapidly. If more than seven minutes are taken for milking most cows the effectiveness of the hormone will have been partly worn out and incomplete milking will result.
8. Do not practice prolonged stripping for such will ultimately make a stripper of a cow.

9. With machine milking operate the machine according to the direction of the manufacturer. Increasing the vacuum or altering the rate of pulsations from those recommended by the manufacturer may make milking unpleasant to the cow.
10. Do not leave the milking machine on the cow after the milk has ceased flowing, for such may cause injury to the delicate lining of the teat cistern.
11. Develop the technic of knowing by feel when the gland has been emptied of milk.

One-Man Haying

By making full use of modern equipment, rebuilding some to suit his needs and ideas, and spreading the job out, haying has been reduced to a one-man operation on the ranch operated by Otto Fry and his son Homer, near Boise, Idaho.

They use a five-day system. The first day a tractor mower cuts about 30 acres in ten hours. The next day the tractor shifts to a rake and windrows the hay. The third day the hay is bucked into piles. On the fourth day the piles are bucked to the stack ground. On the fifth day stacking is done with a mechanical stacker. It's all a one-man operation. When one batch of hay is stacked, another patch of about the same size is tackled. By the time one crop is in the stack it is almost time to start on the next.

The Frys put up the several crops from 110 irrigated acres on this one-man basis in 1942. It certainly licked the hired man shortage.

Most ingenious part of the Fry equipment is their buck rake—an ordinary buck rake attached to a stripped truck. Truck gears have been changed so that the vehicle moves forward in reverse gear, providing slower speed and more power.

—*Farm Journal*

Our Soils in Selected Service (Part II)

William A. Albrecht

Chairman, Department of Soils, University of Missouri

THE soils of lesser degree of development and with higher offerings of minerals for plants in our West have been naturally selected by prairie vegetation. To the East, where the more highly developed soils contain a clay that has become acid because the soil mineral reserve is too low to keep ahead of the clay's demand for relief from its plant-given acidity, the soils have been selected for forest or wood production as their service.

You may carry farther this picture of contrasting the kinds of vegetation and also the chemical compositions of different or even the same vegetation on different soils. Alfalfa, a much prized forage, grows naturally in the Dakotas, Nebraska, and in areas going southward along the line of chernozem soils. This crop is a desirable feed because it runs a particular kind of chemical manufacturing business that requires much of minerals from the soil but through which it puts out desirable growth-promoting substances not duplicated by any other forage. Western well-cured alfalfa has come to be the "medicine" prescribed by many veterinarians. Can this be a selected service by the soils according to their fertility?

In connection with crops, the hard wheats that are relatively high in protein and minerals, also follow this line of chernozem soils, much like alfalfa. If you go eastward from this line to other soils, the chemical composition of the wheat changes to give us soft wheat. This change occurs not for the reason of the extra rainfall but for the reason of the decrease of soil fertility associated with higher rainfall. Corn is grown on the eastern limits of the prairie. It is more of a fattening feed and doesn't grow young animals so well. Cotton and sugar cane are on the red and highly weathered soils of the South. Coffee, tea, cinchona, and other plants as producers of alkaloids, narcotics and poisons grow in the red, or lateritic, soils of the wet tropics. It is no impossible performance to arrange plant species with each fitting into the particular degree of the soil's development according as that plant's chemical composition is mineral-rich, proteinaceous, and excellent in animal growth promotion, or as it is mineral-poor, carbonaceous, woody, and poor (if not even poisonous)

in animal service, respectively, as it is grown on the younger soils that provide much fertility, or on the more weathered soils giving little beyond possibilities for growing wood.

Since different species of plants arrange themselves according as their chemical needs for growth are met by the soil fertility, it is easy to understand why the western soils that are still richer in mineral fertility produce more proteinaceous compounds for which these soil minerals are required. The highly weathered soils that are deficient in lime give plants deficient as protein producers. Such deficient plants still get potassium to make them carbohydrate producers or to deliver sugars, starches, cellulose, and wood. Soils are in selected services with those high in minerals providing us with mineral-rich and proteinaceous vegetation, and with those deficient in mineral fertility giving us woody vegetation. Here is a general principle that locates the soils for their selected services much as physical fitness of humans classifies for military or civilian service.

The principle of plant distribution by species according to the degree of soil development, or its level of soil fertility, holds also for variation in chemical composition within a single species growing over many different soils. This fact has been demonstrated experimentally for soybeans. Given less lime, particularly in relation to potassium, their forages are mainly starches and sugars with little of protein and mineral contents, even under increasing yields. Given ample lime or calcium they are rich in protein as contrasted to their carbohydrate content.

The chemical composition of the wheat grain changes similarly, so that its protein goes from 10 to 18 per cent, as one goes from eastern to western Kansas. The ash content increases accordingly, and, unfortunately, millers of flour have believed this ash increase was proof of nothing more than that dirt and mill sweepings were getting into the flour. The greater lime content in the soil and its greater concentration along with other nutrients, all nearer the soil surface for greater access to plant roots, have not been considered as the cause. Instead, the hardness or protein of wheat has been ascribed to the rainfall, which is not a direct, but an indirect factor, as it leaches out or as it leaves the nutrients in the soil. The soil is selecting its service to the crop. It is not so much the weather that exercises the discrimination.

As a result of these principles, we are now coming to recognize that the declining fertility in the soil is changing not only the kinds of crops we grow, but is also

changing the composition of each crop, whether grains or forages are in question. In the exhaustion of the soil and its increasing acidity there is reason for our search for substitute crops; for our shift to forage from grain production; for increasing troubles in the humid areas in raising animals; and for the greater concentration of these troubles on the less fertile soils, for example even within Missouri, or more simply in the United States as one goes eastward, for example from Texas to Florida, or from Kansas to Virginia. By such selections in going to services of lower quality, the soils demonstrate that they are providing less minerals and proteins for better growth and reproduction in both plants and animals, though they may not yet be falling noticeably short in delivering carbonaceous matter with fattening and fuel values.

Animals, both wild and domestic, have been selecting soils for services needed by them. A few turkeys were available for the Pilgrims in New England. Thousands of bison were on the prairie for the Forty-niners in the gold rush. Even the seed crop of more concentrated nutrient forms was scant nourishment for small birds on leached New England soils, but yet the short grass forage alone on the less developed soils of the western plains made big buffaloes by the hundreds.

Also, the fish crops of the sea are harvested from shallower waters where the larger production comes by their herbivorous rather than by carnivorous habits. Soil fertility of the bottoms of the shallow seas growing vegetation is the fish food. Vegetation with its roots in the soil of the sea bottom, more than floating greenery, renders nutritional services to fish. Fish are commonly believed highly aquatic but are in no unreal sense a terrestrial crop, at least in terms of fertility moved from the land to the sea.

Among the domestic animals, the mule has given Missouri no small amount of fame and publicity. This state as the home of Mr. Monsees, the breeder of great jacks, became well known for this particular beast of burden, as it was grown on his well advertised "Limestone Valley Farms" of Pettis county. The donkey or ass is a sure-footed beast with very fine but extremely hard bones. These are harder than those of the horse and are correspondingly richer in minerals. Is this possibly connected with the general nativity of this animal in lands of drier climates and unleached soils, or with mountainous soils, all where vegetation is of high protein and mineral contents? As we recall the ass as a native in the Orient, in Mexico, in lower California, in Tibet, and other areas that give calcium-

rich vegetation, is it purely a coincidence, that Mr. Monsees and his famous jacks were a combination possible mainly on "Limestone Valley Farms"?

In answer to that question it may be helpful to point out that the jack does well in areas of pedocal soils, as they are classified technically in the western part of the United States. When cross-bred with the horse, to give us the mule, his spirit, and his body as certain physiological functions demanding much lime, can be pushed eastward into the humid soil area. Even then the limits of greater concentration or success of the mule follow closely the line of 40-in. rainfall through Arkansas, Missouri, Kentucky, and Tennessee, but then only on mainly limestone lands. When we observe that mules are not raised in the southeastern United States and yet are growing wild in equally as warm but drier areas, such as the peninsula of Lower California, the conclusion is readily prompted that even the lowly jackass can select our soils for their service in terms of their lime and fertility offerings as needed by him.

Other domestic animals speak up in the same line of thought. Hogs are the mortgage lifters requiring as little as six months for birth, growth, and fattening in the cornbelt. With its high percentage that is fat, or carbon and hydrogen, to be gotten from carbohydrates as corn starch, the hog carcass is not so much soil fertility. Much like fruit, it is more of air and water caught by sunshine power.

For sheep and cattle the selection of soils is more specific. Their reproduction and growth are more successful on the western prairies from proteinaceous, mineral-rich forage with little or no grain. It is there that reproduction is not so much disturbed by acetonemia, milk fever, contagious abortion, and other pregnancy or post-parturition troubles. For fattening purposes these animals are shipped from the arid and semihumid to the humid soils. Argentina in South America and its cattle business, fit into a similar picture of growing the animals in one grass area and fattening them in another. We have not been accustomed to believe the soils so highly selected for these specialized services. Instead, we have been prone to turn to economics, particular market demands, and other causes for the explanation. Stockyards in Kansas City and in Chicago, and the meat they represent, are sites and services of selected soils for them, much more than of the concentrated populations needing the food that would more probably locate them on the eastern shores.

Humans in their health condi-

tions, their body form, mental attitudes, and many other aspects may, too, have been selected according to the fertility services by the soils. The placement and soundness of the teeth, that are an exposed part of the skeleton, the length of the lower jaw, the width of the arch of the upper jaw, and other visible bone features reveal to some keen observers why Hereford, the county seat of Deaf Smith County, Texas, is heralded as the "Town without a toothache". The remunerative business in that part of Texas of producing calves for fattening in the cornbelt, like its banishment of toothaches, is not far removed from selected service by the soils. Perhaps we shall eventually see that the animal and the human physiological pictures the world over are one and the same, blended in colors of brighter success or darker failures and pathos according to the soil selected wisely or unwisely for its fertility supply.

Nature has painted a larger picture of which but fragmentary portions are coming to us as periodic glimpses. Draftee rejections and selections according to soil regions ought to be basic data for study of our disregard in the past of the great force with which our soils have had control over us. The soil, through our foods, directs us, even if the automobile, the railways, and the airlines have brought us foods from far-flung sources or carried us promiscuously about to them. When the present catastrophic human turmoil seethes no more; when we are confined to limited soil areas; and when we even share with the 300,000,000 Europeans that must be fed, we shall be in sore need of understanding how soil must be more than just naturally or accidentaly selected for service, if all of us are to survive.

That the problem can be solved need not be in doubt. There are too many illustrations of partial solution already before us. We need not be overwhelmed by gloom. The science of the soil is just in its infancy. We have not yet begun to use fertilizers over any great area, and certainly not in great efficiency in terms of their selections for the soils as well as for the crops. Fertilizers can come in to balance soils for proper plant growth and plant service in better nutrition rather than for greater tonnage production alone. The great chemical industry that can snatch nitrogen out of the air for human destruction in war can be turned to human nutrition in post-war. While in some instances in the past we may have been hindering the functions of our soils in properly feeding us, we are in a better position now to help them. When the services by the soils so poorly understood can be marshalled on

short order for a world war, surely under fuller understanding and appreciation they can be organized in due time for living during a world peace. None of us will shirk our share in the great task before us.

Early Breeding of Animals

Condensed from California Cultivator

H. H. Cole
University of California

OUR greatest need for more meat and milk makes it essential to review all possible means of increasing production. The age of first breeding is an important consideration.

The opinion is widely held that early breeding has deleterious effects. Aside from the fact that young from animals bred at an early age are usually smaller at weaning than those from mature animals, there is no evidence that early breeding is harmful if the animals are given proper amounts of nutritious feeds to keep them growing. The evidence at hand indicates rather that early breeding is an economical and practical procedure under conditions of liberal feeding.

The Missouri agricultural experiment station has studied the question in hogs. Sows were bred as soon after puberty as possible (about 8 months), at 18 months, and as 2-year-olds. All groups were well fed. Gilts in the first group farrowed before they were a year old. Although the early bred sows reached mature size more slowly than the late bred sows, they eventually were largest. More pigs were produced at less cost by early breeding.

The effect of breeding ewe lambs at about 9 months as compared to breeding yearlings has been studied at the North Dakota station. One hundred and twenty-two ewes bred as lambs raised 78 lambs to weaning. The following year this group of ewes bred as yearlings did practically as well as yearlings not previously bred. Calculations indicated that the procedure was highly profitable. Work done more recently by the U. S. department of agriculture has confirmed this result.

Breeding yearling beef heifers is now being practiced by some beef producers. To prevent the excessive drain of lactation some advocate vealing the calves from the heifers at 200 pounds. Ac-

Reprinted by permission from the California Cultivator, April 3, 1943

cording to studies made at the Oregon and Kansas experiment stations, it would appear that the feasibility of the plan depends upon the level of nutrition. If the range is good or if the range is supplemented, the procedure apparently is practical.

Early breeding of dairy heifers, likewise, appears to be feasible if the heifers are well fed. The California station has shown that retardation of growth can be prevented by liberal feeding.

Under ideal nutritive conditions, early breeding appears to be a practical procedure in all classes of livestock worthy of consideration as a means of production during the present emergency.

"Please Pass the Salt" Say Dairy Cows

"Mr. Dairyman, please pass the salt," dairy cows would like to request, when, with the arrival of spring, they are being turned to pasture, says G. A. Williams, Purdue University extension dairyman.

A cow's requirements for this essential part of the ration varies with the amount of milk produced and the kind of a ration she receives. For each pint of milk old "Bossy" produces, she must have one grain of salt. The more roughage she eats, the more salt she requires. This is especially true of lush spring pasture, which is high in potassium. It has been found that when large amounts of potash are fed to an animal, there is a correspondingly large excretion of sodium (salt is sodium chloride) in the urine along with the potassium.

It is a good practice to feed one pound of salt in each 100 pounds of grain mixture, in addition to salt fed free-choice. This provides all animals of the herd, including young stock, with an ample supply of salt.

Every effort is being made to maintain the production of dairy products at a high level during the coming months. Each dairyman should give every cow in his herd plenty of salt. It is one link in the chain of increased dairy production and the part which it will play in winning the war.

—Jersey Bulletin

Farmers Enthusiastic Over Mow Cured Hay

Condensed from Electricity on the Farm

L. L. Koontz

Division Rural Supervisor, Appalachian Electric Power Co., Bluefield, W. Va.

THE total rainfall during any month of the hay making season in Virginia is not excessive, but is made up of numerous light showers which occur at short intervals. A 28 year record shows an average monthly precipitation of 3.2 to 4.3 inches, with rain on 10 to 15 days of each month during the haying season. Field cured hay consequently suffers greatly, as it does in many other sections of the country.

Relief from this situation is being brought about in Virginia by the installation of blowers and duct systems for finishing hay curing in the mow.

In mow curing, advantage is taken of the very rapid drying of the hay in the field during the first few hours after cutting. Mowing is started in the morning as soon as the dew is off the hay. The hay is allowed to dry about two hours in the swath, and is then raked into windrows where it remains for another two or three hours. This field drying for four or five hours on a clear day reduces the moisture content of the hay to about 45 percent. Placing the hay in the drier the same day it is cut prevents damage from dew, rain, and sun bleaching.

In placing the hay on the duct system, care must be exercised to see that it is evenly distributed and uniformly packed. This has been found extremely important in getting the proper distribution of air through the hay. Best results have been observed where the depth of the hay over the ducts has not exceeded six to ten feet for any one curing. After the initial layer has been cured another may be placed on top of it and cured. For best economy and results the total depth of the hay should not exceed fifteen to twenty feet over the ducts.

The blower unit is operated continually during the day when humidity conditions are such that the air will take moisture from the hay. At night, and during rainy days, air is forced through the hay only as needed to prevent heating. This is accomplished by operating the blower unit one hour at six hour intervals. By this procedure hay can be dried to

Reprinted by permission from Electricity on the Farm, 24 West 40th St., New York City, April, 1943

twenty percent moisture content in seven to fourteen days, depending upon weather conditions and the initial moisture content of the hay when placed in the dryer.

The forced ventilation method of curing hay in the barn was introduced in Virginia in 1940. Three systems were installed; one on the Virginia Polytechnic Institute Experimental Farm at Blacksburg, another on the R. G. Stevens Farm near Dublin, and the third on the I. C. Choate Farm at Sugar Grove. Based largely on the results obtained with these driers the number of driers in Southwest Virginia had reached a total of nineteen at the end of the 1942 season. It would have been higher if farmers could have obtained high enough priorities to purchase fans and motors.

In order to check on just how effective and profitable these mow driers had been to farmers in this area, we asked for comments on their experiences from the operators at the end of the 1942 season.

Mr. Choate said: "I have used this drier system three years and I think it has almost paid for itself each year. All the hay that was field cured was dark and damaged. I think I lost one-eighth of my crop that was cured in the field, while there was no waste at all in the barn cured hay. The drier was a good investment and I have recommended it to several others who have installed the system and seem to be well pleased."

Mr. Stevens went a step farther with his system. He installed a furnace and stoker in order to supply additional heat to the air before blowing it through the hay. At the end of the 1942 season Mr. Stevens had this to say—"We specialize in alfalfa hay for sale as a cash crop. We preheat the air before blowing it through the hay, raising the temperature about thirty degrees. We do not depend on weather conditions to partly dry the hay in the windrow. Our drier holds about ten acres of alfalfa at a time. We start cutting early in the morning immediately windrowing with a side delivery rake, and follow with a hay loader. By evening the entire ten acres are in the drier ready for curing. The time required to dry a batch is from thirty-six to ninety-six hours depending upon dew or moisture in the hay, outside air temperature and humidity. By use of the drier we have eliminated a 25 percent loss in curing and molding. We have no loss of leaves and it maintains a high green color. In fact, the hay inside of the bales when opened is about as green as when cut and for this extra hay we get $5.00 a ton premium. Our outfit cost us approximately $2,500.00 and has more than half paid for itself in premiums alone. We are of the opinion that the

labor saved by only one handling pays for the fuel and power."

In the spring of 1941 Mr. H. P. Musser installed a drier on his farm near Salem, Virginia. After two seasons' experience he says: —"There is no question about the barn drying method making a better quality of cured hay. It always has a green color due to reduced bleaching in the sun, and there are more leaves saved because the hay can be brought to the barn before shattering of the leaves take place. Perhaps the greatest value of the drier comes from preventing damage or entire loss of hay by bad weather. Time and again we have been able to cut hay in small quantities in a period of continuous rain, getting the hay in the drier with only a few hours of field curing, and finishing it in the barn. I cannot emphasize too strongly the tremendous advantage of being able to put half cured hay in the barn and save it from rain damage."

"I cured 358 tons of hay" said C. Henry Harmon of Tazewell. "In my opinion and that of other farmers who inspected this hay, it fully doubled its value by being cured in the driers instead of by the old field curing method. My investment in construction and machinery for the four systems was approximately $1,500.00. I am sincere in my opinion that the investment increased the value of my hay at least $10.00 per ton. I saw hay lying in the fields from a week to ten days that would have been of little value to me, and during this same time, I was cutting and curing mine. I cured hay that was put into the barn with 80% moisture and the lowest moisture content was 55%. It cured almost perfectly. This year was my first experience with soy beans and I was somewhat skeptical whether the drier would do an adequate job. The beans in my estimation cured perfectly. Graded in Washington, the results were U. S. No. 1. I can recommend the forced ventilation method to any farmer and from the experience I have had in curing hay in the field, I don't know of a better investment."

Mr. Harmon is a large dairy farmer. Three of his duct systems are located in one dairy barn 160x36 feet, the other in another barn 80x36 feet. He has three sets of blowers which he alternates between the four systems.

Farmers on smaller dairies have also been well pleased. For example, Mr. A. L. Leffell, Shawvers Mill, wrote:

"I installed this year, 1942, in part of my barn a hay drying system size 20x30 feet. The entire cost for the fan and duct system was approximately $65.00. Without this system, I would have lost at least one-half of my hay. The quality of the hay was 100%

better than hay cured in the ordinary sunshine way."

Mr. J. T. Frazier of Chilhowie cut three crops of alfalfa hay from eight acres of ground. It rained almost constantly at each cutting, but he said—"I saved all of it. The labor it saved is an advantage too. Heretofore, I have always had to shock it, stack it, then haul it to the barn; this time I put it on the wagon after raking it up and put it immediately in the barn. Due to the wet weather, the cost of current used in drying the hay was about $1.00 per ton. This was offset by using less labor. Since labor at that time was almost impossible to get, had I not had my electric hay drier I probably would have lost my hay."

R. G. Williams, fruit and dairy farmer of Wytheville, said:—"There is no question in my mind but that the electric drier saves hay. The drier saves leaves which are fifty percent of the value of the hay. They would be lost in sun curing. The drier was put in a barn that was not convenient for us to get to, so it was operated by a hired man who had no experience with a hay drier. We got some good cured hay anyway, which could not have been done by the field method."

The good hay Mr. Williams referred to in his letter turned out to be U. S. No. 1 alfalfa when graded by the U.S.D.A. He plans to install another system at one of his other barns as soon as he can secure the equipment.

The records on cost of 1942 installations showed a range, depending on the size of the system, of from $80.00 to $350.00. This included lumber, blower unit, labor, electrical materials, pulleys, belts, and one-fourth the value of the motor. Since the motor can be used for a number of other farm jobs, only one-fourth of its value was charged directly to the hay dryer. The cost of the installations varied from fifteen to twenty cents per square foot of mow area.

A summary of operating data for the 1942 season is given in the accompanying table. Many of the systems were not installed early enough for a full season's operation; therefore, the total tons dried are lower than would normally be expected from the nineteen systems. A considerable amount of this hay was placed in the driers with rather high moisture content, as will be noted from the table. Alfalfa, clover, timothy, mixed field grasses, soy beans, lespedeza, barley, oats, and rye were successfully dried. Better results were obtained where the air flow was fifteen cubic feet per minute or more per square foot of mow area.

Plan for a typical blower and duct system for mow hay finisher.

Forty Million Pounds Nitrogen

Condensed from Pennsylvania Farmer

J. W. White

TO meet demands for increased crop production in face of a nitrogen shortage will tax the ingenuity of the farmer and all others entrusted with the welfare of agriculture. We are asked to become not only the arsenal of democracy but also the world's market basket. The arsenal has precedent over the market basket so far as commercial nitrogen is concerned.

Reduction in the supply of soluble nitrogen and restrictions on uses of that furnished for crop production make it imperative that we seek every possible source of nitrogen on the farm that may be suitable as a substitute for the commercial product. In recognition of this fact, the author and his associates in soil research have undertaken a detailed study of the production, composition and use of poultry manure with special reference to its nitrogen content.

The poultry manure study undertaken as a war emergency project has been in progress since June, 1942. The work has not been a pleasant undertaking, but has proved an exceedingly interesting and profitable contribution to this long neglected subject. A review of the literature on the subject serves to confuse rather than enlighten the reader, since the results are quite contradictory and deal for the most part with fragmentary reports of studies made many years ago. Thus, studies made between 1886 and 1915 including 22 different references show a range in nitrogen content of hen manure from 1.82 to 0.3 per cent. In one of our modern text books is a statement that 100 hens averaging five pounds each will produce in one year 4,250 pounds of manure containing 43 pounds of nitrogen. Our studies, however, show that 100 hens will produce in one year 12,700 pounds of fresh manure containing 207 pounds of nitrogen. The figure published in the text book probably relates to the manure deposited on the dropping boards, which we find is 35.4 per cent of the total produced. The nitrogen content reported represents 1.0 per cent, while the truth is that fresh hen manure contains on an average 1.63 per cent nitrogen.

The studies were undertaken to stimulate a new interest in the

Reprinted by permission from Pennsylvania Farmer, Pittsburgh, Penna., Feb. 27, 1943

care and use of poultry manure and to impress on the poultry farmer the value of his by-product. It is hoped, therefore, that this information concerning the true value of poultry manure will become the initial step in an educational campaign that will lead to a better use of this exceedingly valuable poultry by-product.

The scope of the present study includes: (1) Total production of manure by birds of different ages and breeds. (2) Proportions of the total manure recoverable from dropping boards, pits, rain shelters and floor litter. (3) Composition of fresh and stored manure. (4) Value of different added materials as a means of conserving nitrogen and organic matter. (5) Crop producing value of fresh and dried poultry manure compared with barnyard manure and commercial fertilizers. (6) The possibility of utilizing dried poultry manure as a base for the preparation of varied fertilizer formulas through the addition of phosphoric acid and potash. (7) Creating a market value per ton for poultry manure compared with barnyard manure.

The results of manure production and composition are based on a study of approximately 12,000 chickens of three major breeds in 82 flocks and ranging in age from one week to two or more years, and 1,600 turkeys in 12 flocks including four breeds and ranging in age from five to eighteen months. The study includes birds from the college poultry plant and those of 20 commercial poultry farms located in central and eastern Pennsylvania.

Studies of 400 Hampshire Reds and Barred Rocks confined in batteries or cages were found on an average of seven sampling periods (July 1-Dec. 30) to produce annually 127 pounds of manure per bird.

Birds confined in laying houses produced on the dropping boards the equivalent of 45 pounds of manure annually per bird. In other words 35.4 per cent of the total manure produced by birds confined in laying houses is recoverable from the dropping boards or pits and 64.6 per cent is deposited among the floor litter. Turkeys from 6 to 12 months of age will produce annually 369 pounds manure per bird or approximately three times that of laying chicken hens.

On the basis of production figures gained from a study of various breeds of birds together with a knowledge of poultry flock management furnished by extension specialists in Farm Management and Poultry Extension, it becomes possible to estimate closely the total manure produced annually in Pennsylvania and also that recoverable from dropping boards, pits and rain shel-

ters. The following figures serve to emphasize the importance of poultry manure production.

A ton of fresh manure (73 per cent water) contains 32.7 pounds nitrogen, 19.8 pounds phosphoric acid and 7.8 pounds of potash. On this basis the total poultry manure produced annually in Pennsylvania is equivalent to 97,000 tons of sulphate of ammonia, 62,000 tons of 20 per cent superphosphate and 8,000 tons of muriate of potash respectively. The value of the manure in terms of commercial fertilizers is approximately $5,000,000 or $5 per ton.

One ton of barnyard manure contains 10 pounds nitrogen, 5 pounds phosphoric acid and 10 pounds of potash. Fresh poultry manure, therefore, contains over three times as much nitrogen, four times as much phosphoric acid and slightly less potash than barnyard manure. Based on the plant food content and prices used for computing the value of poultry manure given above, one ton of barnyard manure is valued at $1.50 per ton. Barnyard manure is usually given a value of $2 per ton.

During the visit at the twenty commercial poultry farms covered in the study, information was secured concerning the methods of handling manure and prices received per ton. The price varied from $1.50 per truck load to $5 per ton. One poultryman receives approximately $1,200 per year for his manure. In several instances where the poultry plants were located on small areas the poultryman received no returns for the manure and was having difficulty in giving it away. We found this true at a large turkey plant in York county. In one instance the poultry manure had been hauled out in great quantities and dumped into a nearby woods. These unfortunate conditions are made possible by the lack of knowledge concerning the value of poultry manure.

During our inspection of the poultry farms we found without exception that where the plants were located on fairly large farms, and where the entire manure was utilized on the land the poultryman was prosperous. Let us take as example, L. J. Bender and Reubin Ringer, both of Lehigh county. The former, we found, not only uses all his own poultry manure but purchases that produced on two nearby poultry plants. We saw large piles on the farm ready to spread and we took samples of it. Mr. Bender is credited with having produced last year 25.3 tons of tomatoes per acre, the largest yields so far recorded in Pennsylvania.

Reubin Ringer uses his poultry manure by broadcasting it in the clover or rye grass to be plowed for potatoes. He showed us where

the manure had been previously spread on the rye grass and where none had been applied. If all farmers could have seen that demonstration, Abel and Sons of York would not have to give their turkey manure away but could sell all they produce for at least $4 per ton. But that's not all, for Mr. Ringer averaged over 500 bushels of potatoes per acre in 1942.

There is no information from field experiments on this subject, but we have already laid out 88 plots to be used for such purposes including comparisons of the relative values of poultry manure, barnyard manure and commercial fertilizers in the production of potatoes, tomatoes, corn and other grain and vegetable crops.

Unfortunately, poultry manure is very unstable and is subject to rapid decay or putrefaction when stored wet. About 50 per cent of the total nitrogen is present as uric acid (the white cap deposited on the surface of the droppings) which changes very rapidly into ammonium compounds which eventually are decomposed into volatile ammonia. Manure stored for only ten days in a concrete pit was found to contain 46 per cent of its total nitrogen present as ammonium salts compared to only 8 per cent originally present. Examination of 24 samples of stored manure under varied conditions showed that 50 per cent of the original nitrogen and 35 per cent of the organic matter had been lost. These findings were supported by laboratory experiments. During the rapid fermentations of wet manure, considerable heat is created which increases the loss of ammonia. These temperatures were found in the middle of the piles to be from 112 to 120° F. compared with an air temperature of 54 degrees. Manure mixed with the floor litter was found after four months to be sufficiently dried to prevent severe loss of ammonia. This method of storage appears very effective in conserving nitrogen. Thus, the floor litter contained 18 per cent water compared with from 57 to 72 per cent for manure stored in concrete pits and that placed in a poorly ventilated building.

Our experiments dealing with nitrogen conservation in relation to different methods of storage and the use of varied materials have not been completed. We are not warranted, therefore, at this time, in making definite recommendations. May we, however, offer a few suggestions. (1) Haul fresh manure from dropping boards and pits and spread on fields. If barnyard manure is available mix the two in equal quantities on the spreader and if possible spread not more than six tons per acre. (2) Spread out the

fresh manure in a thin layer on the floor of a well-ventilated manure shed and rake with a manure fork. Have bags of superphosphate handy and spread by hand about 200 pounds per ton of manure. Store floor litter in a pile in the same building. When the bed of manure has air dried mix equal amounts of the two and store in pile in one corner of the building. This mixture of floor litter and air dry manure should keep without loss of nitrogen if protected from rain. Manure thus prepared should have a market value of six dollars per ton compared with four dollars for fresh manure.

When used in the vegetable garden for sweet corn, tomatoes, potatoes or leafy vegetables spread fresh manure at the rate of not more than 200 pounds (about five bushels) per 1,000 square feet. Dig or plow it under several weeks before planting. Perhaps fall application would be better for fresh manure since the rapid formation of ammonia will burn young plants. By turning under manure the ammonia will be changed to soil nitrates.

If manure is to be dried as a basis for the preparation of a complete fertilizer it is recommended that only fresh manure be used. To prepare the Victory Garden fertilizer (3-8-7) add to 54 pounds dried manure 35 pounds 20 per cent superphosphate and 11 pounds 60 per cent muriate of potash.

Annual Production

(1) Manure	Tons
Total manure produced (chickens and turkeys)	= 1,248,000
Produced on dropping boards, pits and rain shelters	= 338,000
Produced in floor litter	= 379,000
Produced on open range	= 531,000

(2) Nitrogen	Tons
Total (32.7 pounds per ton of manure)	=40,817,000
Produced on dropping boards, pits and rain shelters	=11,065,000
Produced in floor litter	=12,399,000
Produced on outside range	=17,353,000

Lambing Time

Condensed from The Eastern Breeder

George W. Litton
Assistant Extension Animal Husbandman, Virginia Polytechnic Institute

JUST after finishing college, or even during my eight years of county agent work, I could have written a story about lambing time in which I would have had the utmost faith and confidence. Right now, I'm not so sure. You see, I'm just back from the lambing pens where we are lambing out 200 grade ewes and 50 purebreds, and I have seen several exceptions to the things I once knew to be absolute truths. In the four seasons I have been in direct charge of these ewes, I've seen the over-fat ones breed first—a thing I once knew to be wrong; and many times I see a fat ewe that won't give milk when her lambs are born—a thing that only an undernourished and emaciated ewe is supposed to be guilty of. I see ewes with udders strutted full of milk that kick their lambs off and won't own them, whereas always before it was the lack of milk with which to raise their lambs that caused this non-ownership. And so it goes, something happens in the lambing pens daily that causes me to wonder about something I have told a farmer in good faith some years ago.

Many lambs are still-born or die shortly after birth. I couldn't attempt a scientific explanation, but here are a couple of theories of mine. Anybody knows there are many things that might contribute to this death, but quite likely there are one or a few things largely responsible. In keeping breeding dates on our purebred ewes here at the college, we find that those ewes which lamb on the 147th day, or from one to five days before this time is up, will have stronger lambs and fewer born dead. Incidentally, if a lamb is born that has a birth weight of less than five pounds, he has a better than 80 per cent chance of dying before the week is up. We find that a lamb's birth weight increases slightly as the ewe gets older up to six years old, but the same ewes will have small lambs rather consistently. We've about decided to cull that kind. Going back to the first point: Every day a ewe carries her lambs overtime adds greatly to the chances for death. The question is, of course, how to get them born exactly on time or before. This, of course, is regulated by hormones and the one in

Reprinted by permission from The Eastern Breeder, Warrenton, Virginia, March, 1943

the uterus called "pitocin" is probably the main one. However I believe birth is influenced in a ewe by a sudden change of the weather, green feed or succulence in the ration, and plenty of vigorous exercise. We don't seem to be able to do much with the weather, but the other two items we can control. My other pet theory on this still-birth will make you laugh, but here it is: We have religiously kept one band of these ewes out of any kind of falling weather since November 15 up to now, and so far we haven't had a lamb still-born in this bunch. I might add that records over three years show several of these ewes to be habitual at dropping twin lambs with one dead at birth. They didn't do it this time. This may be hot air and go the way of thousands of other theories, but at any rate try from now on through your lambing period to keep the ewes out of all falling weather. To see that characteristic nasal discharge that some folks think belongs to a sheep dry up and go away will please you. That's what has happened with ours.

Pregnancy disease among ewes at lambing time is the most discouraging thing that can strike. This disease was reported in Missouri as early as 1918 and so far as is known, no part of the United States is free from it. It will be seen more often in ewes carrying twins or triplets and of middle age. Yearling or real old ewes are rarely susceptible. Thin ewes are more often affected than ewes abundantly fleshy, and those which are losing weight instead of gaining are more apt to come down.

The first symptoms will be evident in ewes that are listless, dull, lying around more than normal, and grinding or gritting the teeth together. When they exercise, the muscles quiver and trembling is evidenced. Later, partial paralysis seems to set in, the head is drawn around to one side, the ewes can't swallow and appear to be blind. Complete paralysis usually results, blood pressure rises, edema follows. There will be no fever. Death occurs in 90 per cent of the cases.

Probable causes of the disease are given as constipation, not enough exercise, too much coarse roughage as timothy hay, pregnancy, decrease in blood calcium, minor element deficiency, acidosis which means too great reduction of the alkali reserve of the body, ketosis, etc. In other words, the definite cause is unknown, but you are less likely to have it under the proper management scheme.

The prevention and treatment of the malady is good management.

1. Feed a ration high in carbohydrates—plenty of molasses or syrup for pregnant ewes.

2. Plenty of exercise to aid elimination and keep circulation aroused.

3. Give liberal amounts of legume hay. Alfalfa is thought by many to be a definite cure.

4. Keep ewes gaining in weight even if fat. Have them put on 25 pounds during pregnancy, with a high percentage of it the last month before lambing.

5. Wheat germ oil is beginning to be written up as an aid.

6. Sufficient vitamins and minerals always necessary.

7. Plenty of linseed meal, ensilage, and other laxative or succulent feeds in the ration.

You can readily see from this that these are simply good management practices, and one can read in the literature on the subject that each of these steps has helped in some test or other. Personally, I believe one of the strongest points in the program is to have them rapidly gaining in weight the last 30 days of the gestation period. They will naturally gain because the lambs they carry will almost double their weight in this period, and many think because the ewe looks full in the sides that she is doing all right. The main reason why I like to feed our ewes grain at least 30 days before they lamb, even though they are in good flesh, is because the rapid growth of the unborn lamb is taking up a lot of room and space and is crowding the digestive system of the ewe. It stands to reason she has less capacity to handle coarse rough feeds, yet needs an abundance of nutrients to take care of the almost explosive growth rate of the fetus during the last months of pregnancy. Since she has less space to put it in, the only thing left to do is give a ration in a more concentrated form —a good grain ration sufficiently concentrated, yet with sufficient laxative effects, is the only possible way to add flesh to the ewe during this period.

I don't suppose there is need to mention that long wool tags should be taken out of the ewe's udder to keep the young lamb from getting a wool ball in the stomach. Neither is it necessary to mention having wide doors to the sheep barn or having individual lambing pens for each ewe and her lamb, so they don't get separated or mashed. In case you saved a lamb that was chilled, you probably wrapped it in a blanket or immersed it in a bucket of hot water, but maybe you didn't give it the tablespoon of mineral oil the next day, which is necessary most of the time to save its life. Why it should be, I don't know, but after a lamb has been thoroughly chilled, constipation usually follows. Some

shepherds may neglect to drop a new-born lamb's navel cord down into a bottle of iodine, and if no lambs are lost with navel-ill, it doesn't make any difference, but the cost of taking the precaution is too small to miss. The lambing pens and sheep house must be cleaned frequently. Lime it down well and let it air out all day before the bedding is replaced.

Modern Management for Missing the Moult

Condensed from Pacific Poultryman

Wallace M. Fox

EVERY poultryman who is in the business as an egg producer has the problem of the annual moult to disturb his well-laid plans. This is a normal event, occurring each year in the life-cycle of laying fowls. With only a few exceptions do birds ever escape this annual change. Its beginning and its duration have never been brought entirely under human control. Climatic or seasonal changes along with management, feed and disease upset all calculations and make its definite occurrence as to time and length most unpredictable. It may be uniform in the flock or it may be very sporadic; it may be rapid, lasting only a few weeks, or it may be slow, lasting as much as a few months. Whether it be short or long, uniform or otherwise, when it is well under way one thing is always certain, production practically disappears.

It is this gap in the egg output that puts so many poultry-growers on the spot. While egg income has ceased, the feeding costs go steadily on. Only a small percentage of poultrymen exercise forethought and save sufficient profits from the high production months to cover their feed bills during the annual moult. Many a fine flock has been sacrificed to the butcher because the poultry-farmer could not withstand the financial out-go during the interval of this event.

Strange as it may seem, poultrymen in general, have failed to consider the possibility of escaping this problem entirely. As a matter of fact it can be completely by-passed if you are up-to-date; the only exception being that which applies to those engaged in the producing of breeding stock. It is a known fact, proven by all egg-laying contests, that a fowl produces the largest

Reprinted by permission from the Pacific Poultryman, 2015 Second Ave., Seattle, Washington, Jan., 1943

number of eggs in her pullet year. Then the question naturally arises why ever keep a commercial hen beyond her first egg-laying year?

Here is a procedure that for simplicity and results meets the full requirements that poultrymen have hoped for in a steady and constant production every day from one year's end to another. The fowls selected for this are Rock-Red hybrids. Fowls of other breeds may be just as suitable. These birds, as you know, come from two of America's finest table varieties. When they are three months old the pullets are selected from the fryer pens and put into developing yards. At five to five and one-half months they come into production, starting mostly with medium and large eggs right from the beginning. From the fryer flock each two weeks or each month a new pen of pullets is thus selected throughout the year. Close observation is kept on each pen after reaching laying-age and any defective or slow developing pullets are promptly removed and sent to market as fat young roasting-hens, where they are always in demand and at a profit producing price. This observation is continued over each pen until the first signs of a moult appear. As soon as a bird shows this condition interfering with her lay, she is removed and sent to market. Consequently, the poultry-grower never has a laying pullet in moult or out of production and at all times this production is from fifty to seventy-five per cent constant. It is an endless chain process. New pullets each two weeks or each month replacing those that have reached the moulting period. The mortality is low, the vigor of the flock is high and when the grower has accommodated his housing and equipment to this type of set-up he has a constant and dependable flow of eggs, enabling him to select and provide fancy markets because of the quality and stability of his output.

It is also a known fact that it costs just as much or more to maintain a flock through the moult and bring it back into production as it does to raise a pullet from chicks to the same equivalent egg output, while the income from the disposal of the undesirable or moulting pullets is a handsome supplement to the egg profits of the year. A more delicate eating fowl is thus placed on the market and the eggs produced are of the highest quality. When this set-up is once established and in full swing at a poultry plant the moulting problem is only a memory of the past. This is not a theory. We have done it repeatedly and we know.

Watch Out for Cholera

Condensed from The Furrow

Glenn W. Sample

JUST as Axis submarines lurk along United Nations' shipping routes, so does hog cholera lie in wait for farmers who have their vaccination guard down—always ready to deliver a lethal punch to unprotected herds.

While much about hog cholera remains unknown by veterinary scientists, hog farmers can be assured that pathologists do "have the number" of this deadly enemy. The experiences of thousands of farmers have proved that proper vaccination will take the sting out of any hog cholera that may be lurking about feed lots and fields in the United States and Canada.

How much does this protection cost? Generally the price of one hog about market size pays the vaccination bill for fifty to sixty pigs at weaning time. Dr. C. R. Donham, head of the veterinary science department at Purdue University, says a farmer probably can do better in a poker game with the cards stacked against him than on a porker game with unvaccinated hogs.

Estimates are that the toll taken by hog cholera in the United States last year was upward of $50,000,000. Doubtlessly, much of that huge bill was paid by farmers who last spring said: "We'll get by this year," or "We don't have any cholera germs on our farms."

Like smallpox, chickenpox, foot and mouth disease, and dog distemper, hog cholera is caused by a virus. It is no relative of fowl cholera, or of the Asiatic cholera which kills human beings, for these two diseases are caused by bacteria. It strikes only at hogs (and not at other classes of livestock), and is equally dangerous to young and old animals, regardless of breed or weight. Time of year is no factor, for outbreaks often occur when least expected, in either the coldest or hottest of weather. Epidemics vary in severity, and follow no set pattern.

Livestock health authorities in various sections of the country have said that the nation is due for another big wave of hog cholera. Livestock farms now are operating at top capacity, and approved sanitary practices are harder to follow than usual. Also, many farmers now are producing and feeding their first droves of hogs.

Reprinted by permission from The Furrow, Moline, Illinois

While cholera attacks hogs in many ways, the result generally is the same—death. Dr. L. P. Doyle, who has spent years studying hog cholera at Purdue, explains that a typical symptom is when one or two animals "go off feed," and are followed by several more a little later. When that happens, it is high time to call a veterinarian for an accurate diagnosis. Prompt investigation also is indicated when a hog's normal temperature of 101 to 103.5 degrees goes above 104.

The presence of button ulcers in the large intestine of posted animals is the most conclusive evidence of cholera. The disease also affects the lymphatic glands in a characteristic way. Sometimes small red spots or diffuse purplish coloration of the skin occur on the animal's belly. Red spots of varied sizes often occur on the lungs, kidneys, and other internal organs. Cholera hogs may have either loose or constipated bowels, and have been known to vomit and have fits.

There is close relationship between the number of cholera outbreaks and the volume of traffic in hogs, as well as the period when communication between farms is greatest, such as threshing and hay-making times. Contrary to general belief, there is no relationship between cholera occurrences and the feeding of new corn, or giving hogs access to coal, such as might be left by a steam threshing outfit.

Now . . . what about this double immunization which does such a good job of keeping cholera from killing hogs of all sizes, ages, and breeds? It consists of simultaneous injection of anti-cholera serum and hog cholera virus. The serum alone will produce a passive protection, lasting from ten days to three weeks, while the combined serum and virus, when properly administered, produces active immunity which may be permanent. The amount of serum and virus to be used on hogs of various ages and sizes had best be left to the judgment of a competent veterinarian.

Don't wean, castrate, and ring your pigs at the same time they are injected with cholera serum and virus. Vaccinate pigs just before or just after they are weaned. It is best to allow a period of ten days between vaccination and weaning (or any other process which would lower the animals' resistance). If you buy pigs that have not been vaccinated, have them vaccinated within twenty-four hours after they reach your farm. Also keep them isolated from other hogs for two or three weeks.

Although vaccinated sows which are nursing pigs will provide them with some immunity, this resistance is not enough when the disease is so prevalent. Many

nursing pigs—which could have been saved by vaccination—succumb to cholera every year.

There are several ways in which you may lessen vaccination hardship on your hogs. Withhold feed at least twelve hours before vaccination. A limited grain ration, about what they will clean up in thirty minutes twice a day, should be given to the hogs after vaccination. It is not necessary to feed grain if they are on clover, alfalfa, or other forage crop pastures. Keep close watch on every recently vaccinated hog; animals which act strangely should be isolated for observation and special treatment.

Occasionally serum and virus "breaks" occur. Why? Well, hogs vary in their susceptibility to cholera virus. Generally, if it happens at all, a serum break occurs within ten days after vaccination, while a virus break usually comes from one to three months late. Sometimes it is impossible to explain a virus break, but it is known that virus of relatively low potency, often a result of keeping the virus at too high temperatures, will not produce active immunity against cholera. Often the "necro" reported in herds about a month after vaccination is really hog cholera, caused by a virus break. The temporary immunity period is over, and the impotent virus has failed to build up permanent protection.

Much improvement has taken place in the production and refinement of hog cholera serum and virus during the last twenty-five to thirty years. Now we seldom hear of a case of abscesses resulting from cholera vaccination, but there was a different story not so many years ago.

While the double immunization process has proved quite successful, veterinary scientists are not entirely satisfied. They have been busy looking for other methods of achieving hog cholera immunity. Several new processes have been reported. Probably the best known are the B.T.V. (Boynton Tissue Vaccine) and the crystal violet vaccine. Both of these are now in the practical proving stage. They have some things to recommend them for some herds of swine, but not for all herds under all conditions. The two processes, based on a somewhat different principle of immunity from the proved serum-virus method, consist of treating the hog cholera virus with certain chemicals to reduce or destroy its capacity to reproduce. The crystal violet immunization was developed by the late Dr. M. Dorset of the United States bureau of animal industry.

Clods Are Robbers

Condensed from Wallaces' Farmer and Iowa Homestead

BIG clods on spring-plowed fields mean a lot of extra labor to get the seed-bed for corn and soybeans in good condition.

Corn and soybean roots can't use plant food in big, hard lumps, so, unless the clods are prevented from forming, or are broken up, it means that part of the soil fertility is locked up for the crop season.

Cloddy land in April may be due to several causes, some of which the farm operator can prevent now, and some of which can only be prevented by a long-time program of building a soil that works easily.

The most common preventable cause of cloddy land is working the land when it is wet, or letting livestock puddle it when the frost is going out in the spring.

Every cow track makes a clod at a certain stage before the land settles in the spring. At this stage, a wagon driven across a field will leave a trail marked by clods after the land has been plowed.

It may be inconvenient sometimes, but cloddy land can be prevented by keeping the livestock in the yards when the land is wet. And waiting until the land is dry enough to work may be a sort of nervous strain sometimes, but it's a time-saver in the end.

Clods will result from letting the land get too dry before it is worked, as well as working it too wet. Early plowing will put the land in better tilth than waiting until it has dried out as deep as the furrow and cracked open. If plowing must be delayed, the land should be disked or harrowed to close the cracks and hold the moisture.

Farmers have often noticed that fewer clods are formed when the soil is turned down the hill. On sloping fields, the plowing lands can often be arranged so the soil will be turned with the incline, which will turn the trash under better as well as crumble the soil better.

If clod preventives fail, there is a remedy that is quite effective if used in time. One harrowing within a few hours after plowing, with the harrow going in the same direction as the plow, will do more than two or three harrowings afterwards.

However, on land that washes badly, the advantage of immediate harrowing for this crop might have to be weighed against the

Reprinted by permission from Wallaces' Farmer and Iowa Homestead, April 3, 1943

possible loss of soil and moisture by a heavy, washing rain. Land can be too smooth on steep hillsides.

But there is something in the nature of the soil that creates clods sometimes. You will often hear farmers say: "That field is always cloddy, while that one over there works easily and doesn't wash very much."

In some cases, the land may run together in lumps because it lacks organic matter. Organic matter is decayed vegetable matter, such as stalks and roots of plants. After it decomposes so it can not be identified, it is known as humus.

Organic matter in the soil, in the form of partly decayed roots or stalks, tends to keep the soil broken up. Pick up a big clod and break it open. Probably you will see that it has broken where there was evidence of decayed matter, which formed a line of weakness, causing the clod to break there.

This decayed matter makes the soil crumbly, lets both water and air into it, which are necessary for proper root growth, and both organic matter and humus serve as a storehouse for nitrogen, phosphorus, potash and other elements necessary to plant growth.

You can't change the organic matter in the soil enough this year to do very much good, but you can adopt practices that will improve the soil in years to come.

Plow under everything that you can. Even weeds form organic matter. Keep sod crops in the rotation. And the bigger crops you raise thru fertilizing and good farming, the more organic matter will be added to the soil, thru the decay of roots, straw and stalks.

But will plowing too much under cause something as bad as the clods? "Too much straw and stalks plowed under will cause the crop to 'burn,' especially in hot, dry weather," is a statement often heard in defense of burning crop residues off the land, and there is a possibility of crop damage that way.

Soil experts say the damage to crops in a hot, dry spell after dry matter has been plowed under is due to nitrogen starvation of the growing plants. At a certain stage of decay, nitrogen is used by the soil bacteria in breaking down and decomposing the plant structure.

When rapid decomposition occurs at the time when the corn needs nitrogen, damage to the crop occurs.

But the nitrogen is only borrowed and used in the process of decay—it is not consumed. The final result is to add to the nitrogen content of the soil as well as adding organic matter.

On the other hand, when the stalks or other crop residues are

burned, the nitrogen goes into the air, and the ability of the soil to store nitrogen is reduced because fire destroys organic matter.

Therefore, plowing under crop residues presents a possibility of temporary shortage of nitrogen for the growing crops, but burning the crop residues destroys nitrogen and makes nitrogen starvation a chronic condition, increasing year by year, unless nitrogen is restored from other sources.

The danger to the succeeding crop by plowing under large amounts of crop residues does not exist when the residues are plowed under green, or when there is plenty of rain, as decay is then farther along when the crop is needing nitrogen.

"Farmers don't burn stalks around here like they used to," a Marion county, Iowa, farmer said in reply to a question.

Farmers are apparently deciding that smooth, crumbly plowed fields in April, with enough organic matter to hold moisture and plant food, are worth the chance of occasional "burning" because of plowing under stalks and straw.

Kentish Wild White Clover

Idaho harvested last fall the nation's first crop of certified seed of Kentish wild white clover, a legume which has helped England get such grand and productive pastures, some of which have been on the job 50 years without plowing.

With pastures taking the front seat as a means of increasing meat production, seedsman R. R. Spafford teamed up with Peter Link to try the English clover on Link's farm in Twin Falls county. They seeded 42 acres in the spring of 1941 at the rate of six pounds to the acre, with a barley nurse crop.

During the 1942 growing and harvesting season visitors came to the Link farm from far and near to see the new crop. The crop amounted to 25,168 pounds of cleaned seed.

Certification rules were strict. Among many things, the rules required that the seed be grown on land which never before had produced any white clover, and at least one-quarter of a mile from any other clover planting.

This Idaho certified seed is expected to be the basis of widespread tests in all sections where pastures are important. Thus far it has not been tested widely in the United States.

—*Farm Journal*

Family-Size Fruit Trees

Condensed from Capper's Farmer

H. B. Tukey

New York Agricultural Experiment Station

DWARF fruit trees offer interesting possibilities for the farmer or home owner who desires to produce his own fruit. Their small size permits close planting and a few trees will afford gratifying variety without bewildering abundance. The smallest type may bear the first year and can be depended upon to do so the second, so there is no long wait for a harvest. Both fruit and trees can be adequately protected from diseases and insects with simple, inexpensive spray equipment. Pruning, thinning and picking of the "very dwarf" type can be done from the ground, since trees are about as tall as a man.

Interest has also been accelerated by the impact of war. Rationing of foodstuffs, restrictions on travel, shortage of labor, problems of transportation, all these turn attention to producing foodstuffs as close as possible to home. The dwarf fruit tree fits nicely into this scheme of things.

Altho there is nothing new in the general idea of dwarf fruit trees, there are new developments and improvements in dwarf tree production and culture and in the type of dwarf trees available.

The first of these improvements is the introduction of new and standardized dwarfing rootstocks. A dwarf fruit tree, particularly the apple and the pear, is produced by propagating the desired variety upon a special type of dwarfing rootstock. Some varieties of fruit are naturally dwarfish, but in the main, a dwarf tree is produced by growing it upon a dwarfing rootstock.

Some rootstocks formerly used were unsatisfactory; and most all of them were mixed. The new ones are standardized, so that their performance can be definitely relied upon. They are called "Malling" rootstocks, named for the East Malling Research Station in England where they were standardized. One of them, called the "Malling IX," produces a very small plant; another "Malling I," produces a semi-dwarf; and still others produce varying degrees of dwarfing up to scarcely dwarfing at all. And so a given variety, as McIntosh, is marked-

Reprinted by permission from Capper's Farmer, Topeka, Kansas, March, 1943

ly dwarfed on the Malling IX rootstock, is less dwarfed on the Malling I, and is still less dwarfed on the Malling XIII. To speak of a "dwarf" tree is no longer sufficient; it is about like saying "red" apple, which might mean anything from a McIntosh to a Ben Davis. If it is the "very dwarf" type tree that is desired, one should be sure to ask for the desired rootstock by name just as he now does for the scion variety which he wants.

The degree of dwarfing which arouses most interest just now is the "very dwarf," produced by working upon the Malling IX rootstock. Trees on this rootstock blossom the first year set in the orchard, may bear some fruit the first year, can be counted upon to bear the second year, and grow no taller than a man. Until recently such very dwarf trees were thought of primarily as ornamentals and for the amateur gardener. But they have been yielding beyond what most planters have expected. For example, 4-year-old trees growing at Geneva, New York, this season averaged about a bushel of fruit a tree, and they had already borne 3 smaller crops in previous years. To harvest 5 or 6 bushels of apples from 5 or 6 trees, each a different variety, trees shoulder-high, planted 8 to 10 feet apart, is quite an inspiration.

Most of the common American varieties of apples which have been tried on this rootstock do very well. Grimes Golden and Jonathan have been especially good, and others which have succeeded include Baldwin, McIntosh, Early McIntosh, Delicious, Northern Spy, Wagener, Winesap, Wolf River, Turley, R. I. Greening, Cox Orange, and Cortland. The varieties which grow naturally quite small, as Gallia, are so severely dwarfed on the Malling IX rootstock that it is questionable whether they should be worked upon it.

There are, however, serious handicaps which these very dwarf trees possess. First, they are shallow-rooted, and in consequence tend to lean away from a prevailing wind or may actually be blown over. Further, they may suffer from summer drouth and from winter cold. If planted with the union below the ground level, the scion may take root and the dwarfing influence of the rootstock may be lost. In favored horticultural sections, as in the lake region of western New York, they have been quite at home. How they will behave outside of this range is a question not yet fully answered.

Yet something can be done to meet some of these handicaps. Mulching the ground under the tree heavily with straw is good practice. Also, if blowing is a problem, a 30-inch stake set at

an angle of about 45 degrees and tied to the tree against the prevailing wind will aid appreciably in holding it in place; and care to set the tree so that the union is at the ground level will help to avoid scion rooting.

But one need not confine himself to the apple nor to the very dwarf type of tree. In less favored sections, other materials may be resorted to. Such smallish apple trees as Anoka, Gallia, Rome, and Cortland may be useful under such circumstances. Also, there are dwarf pears available which are produced by grafting upon the quince root. The peach, the sour cherry, and some native plums are likewise useful in a small planting for the home, and the trees are sufficiently small without resort to additional dwarfing. The catalog of the nurseryman is likely to carry an assortment useful for the region, and if more details are desired, word to the home State Experiment Station will bring the added information.

The problem of insect and disease control always has been a nightmare for the small planter. But here, again, the right attitude will succeed. Modest equipment of the type available in local hardware stores or mail order houses, using standard spray materials according to manufacturers' recommendations, will produce surprisingly good results. The writer has been using a spray program for several years which he has christened, for want of a better name, "Holiday Spray," and which consists in spraying before bloom, after bloom, on Decoration Day, and on the Fourth of July, using a mixture of arsenate of lead, rotenone, and wettable sulfur.

An expert entomologist, or a good fruit grower, would rightly laugh at the inadequacy of such a schedule, but this is no attempt to produce fancy fruit for sale on the quality market in competition with commercial fruit growers. It is rather an attempt to grow with a minimum of time and effort, a reasonable variety of reasonably sound fruit to be consumed at home where it is produced. The dwarf tree and the home planting, developed with this point of view, is of unending satisfaction.

Using Horses and Mules Efficiently

Condensed from The Horse

Wayne Dinsmore

Secretary Horse and Mule Association of America

IT is in keeping with the all-out war effort, for farmers to use horses and mules as much, and mechanized equipment as little, as possible. This will reduce the use of engine fuel, reduce demands on railway transportation, will lengthen the life of mechanized equipment by reducing wear, and will increase the likelihood of getting through next season without equipment repairs, which may be hard, or impossible, to get.

Steady, sensible use of horses and mules, with proper care, feed and management, increases their effectiveness—so much so that 4 horses or mules, wisely handled, can do the work usually done by 6.

Internal parasites, if present, should be eliminated promptly. A good veterinarian, by microscopic examination of the manure, can determine whether parasites are present, and advise effective treatment. Horses or mules thrive better when free of internal parasites, are healthier, more resistant to disease, and can do more work.

Good grass and legume pastures, or winter grain pastures, grown on rich or well fertilized land, choice, green colored, sweet smelling hay, half of it alfalfa, the rest any good hay, preferably mixed timothy and clover, and sound, yellow ear corn, with clean oats—equal parts corn and oats—are the only feeds needed.

All horses and mules should run out on pasture whenever not at work; grain allowance should be one pound for each 100 pounds live weight when at work, less when idle; hay in whatever quantities they will clean up. Good water and iodized salt should be available at all times.

Regular work, or as much as is possible, should be given all work animals, so that they will be muscled and ready for steady work. When spring work starts, put all animals to work, so that they may become hardened up gradually while the weather is comparatively cool. You can either use more animals on a given implement than usual, or change teams at the noon hour; but see that all get work every day. It is the regular, every day work that hardens work animals,

Reprinted by permission from The Horse, Otis Building, Washington, D. C.

just as the daily training given to race horses or athletes puts them in condition for great races or extraordinary feats of strength.

Feet should be kept trimmed level, starting with foals. It is a good idea to look over the feet of all animals on the first Sunday of every month, trimming any that need it. Some need attention; others will go 90 days. Harness should be put in first class condition, repaired, cleaned and oiled.

Demand on critical war materials by horses and mules is slight, as harness for a pair requires only 34 to 47 pounds of harness hardware, made from iron or steel—average about 40 pounds—and this lasts from 6 to 12 years.

Practical conservation measures which now are being adopted and recommended by good farmers, are:

1. Sell inferior, unsound horses nowand replace them with sound, good type young mares. The spread now is less than for many years, hence the shift from inferior to good animals can be made economically.

2. Breed all mares in the spring to a good jack or stallion. On the average only 4 mares out of 6 bred will foal, and only 3 out of the 4 foals will survive to maturity; hence, on the average a man will mature half as many horses or mules, as he breeds mares. We are raising only about ⅔ as many horse foals and less than ⅓ as many mule foals as we need for replacements to offset annual losses by death.

Mules in the United States were valued January 1, 1942, at $107 per head, all ages included; horses at only $65.00 per head. The average farm value for the 10 years, 1931 to 1940 inclusive, was $98 per head on mules, $76 per head on horses. This price difference, plus the fact that mules are more readily sold as foals, yearlings or 2 year olds than horses, makes it wise to raise mules rather than horses, whereever a good jack is available.

Certainly all inferior mares, from either work or riding stock, should be bred to jacks rather than to stallions, so that their faults may die with them.

3. Young mules must be kept separate from young cattle, sheep or hogs, as they will harass and even kill such stock. Many, for this reason, prefer to sell mules at weaning time.

4. All foals should be halter broken and made gentle by quiet methods before they are a month old, broken to harness and to drive as yearlings, and driven hitched to wagons to complete their gentling when 2 years of age. All this can be done at odd times, when wet weather prevents work in the fields.

5. Raise foals well, but economically, carrying them on excellent pasture and choice hay, plus the dam's milk, till weaning, and on good pasture and extra good hay from then till 3 years old—no grain at any time. Young work stock needs no grain if pastures and hays are good. Let them run out on pasture the year round and in addition let them have access to all the good hay they will eat, from October 15th till May 1st. Hay should be at least half alfalfa, balance mixed clover and timothy, or other hay equivalent to the clover and timothy—but all hay should be choice, green colored, leafy hay, sweet smelling and free from any evidence of mold, as mold will kill horses almost as quickly as a rifle bullet.

Where bluegrass is not available for winter pasture, or does not grow sufficiently to furnish green winter feed, a mixture of winter rye and winter wheat—hardy Turkey Red—should be sown in September or early October for late fall, winter and early spring green pasturage. Recent scientific work proves that such green pasture from winter grains has growth-stimulating and health-building, virility-creating qualities equal to young, fast growing bluegrass in early June; hence it should be provided. Use whatever winter grain pasture is available. In the future provide winter pastures. Seeding may well be 3 bushels to the acre —half rye and half wheat—sown solely for pasture, and the land planted to other crops after May 1st. Winter barley, winter oats, and winter vetch should be added to the above, wherever they will survive—which is usually south of the 40th degree of latitude, for which see any good map of the United States.

Dr. O. B. Kent of the Quaker Oats Company states that late research work has definitely established that the green plant growth in grasses or in growing winter rye, wheat, barley, or oats is above 20% in protein and high in all the vitamins needed by animals, up to the time of "jointing." Jointing is seen when a ring forms around the stem: after that the protein and vitamins are much less in percentage and availability; hence it is profitable to have a succession of green pastures the year round, each of which can be grazed off before jointing occurs. Dr. Kent added that it had been proved that no harm occurs to winter grains intended for harvest the following season if the green growth is not grazed after jointing occurs; in fact, yields are increased by pasturing if stock is taken off at the right time.

Pasturing is limited, of course, to times when ground is frozen, or when land is dry enough to

run the colts on it without danger of puddling the soil.

6. The foregoing practical suggestions will supply good replacements at low cost, and older animals can be sold off each season as the three year olds become available. Nearby farmers who do not raise their own replacements are usual purchasers.

Ketosis in Dairy Cattle

Condensed from The Jersey Bulletin

Dr. J. C. Shaw
University of Connecticut

UNTIL recently little attention has been given to a disease of unknown origin, which is rapidly becoming a major problem in many dairy herds. This disease, commonly known as "acetonemia" or more correctly as "ketosis," is prevalent among well-nourished, high-producing dairy cows. It usually occurs following freshening in the late winter and early spring and is sometimes mistaken for milk fever.

The term "ketosis" refers to the presence of an excessive accumulation of substances called ketones in the blood and urine. These substances are also called acetone bodies, hence the term "acetonemia," meaning an excess of acetone bodies in the blood. When the concentration of ketones or acetone bodies in the blood is abnormally high, there is a marked increase in the excretion of these substances, resulting in an abnormal concentration in the urine. Therefore the term "ketosis," meaning an excessive accumulation of ketones in both the blood and urine, is more correct from the scientific viewpoint.

The economic loss in herds affected is considerable, the loss of milk production being proportional to the severity of the ketosis. Even after the recovery of the animal, milk production continues to be affected because of the loss in weight suffered by animals during the course of the disease. Because of the sweetish taste of the milk, which is objectionable to many consumers, the milk is often discarded. The off-flavor is due to the presence of an abnormal quantity of ketones which pass from blood into the milk. In severe cases the animals are sometimes lost, particularly when the condition is associated

Reprinted by permission from The Jersey Bulletin, Indianapolis, Indiana, Apr. 20, 1943

with complications such as metritis.

Even the term "ketosis" is a misnomer. The condition is fundamentally a derangement in carbohydrate metabolism, resulting in a deficiency of sugar in the blood. As a result of this deficiency the animal body must burn more fat for sufficient energy. The acetone bodies which accumulate are intermediary products formed during the burning of fat and they increase in proportion to the increased combustion of fat. Ketones are similar to the fatty acids in butter fat which are responsible for the objectionable odor of rancid butter. However, most of the symptoms noted in ketosis are due to the low blood sugar and not to the excessive accumulation of ketones. In the more persistent cases excess ketones produce an acidosis similar to that associated with diabetes in humans.

Ketosis is frequently mistaken for milk fever because the symptoms are sometimes quite similar. Ordinarily, milk fever develops within a day or two following freshening, and the cows usually become paralyzed.

In all of the cases in which blood studies were made before the onset of the disease, ketosis developed within one to three days following freshening but symptoms were usually not observed until several days later, and only in rare cases did the degree of in-coordination approach that of the paralysis typical of milk fever. Frequently, in milk cases, there were no signs or symptoms of ketosis and the condition was detected only because the blood picture was being followed. The first symptoms in some animals may be a tendency to be lethargic, or failure to clean up the usual amount of feed. If no treatment is given a marked in-coordination may develop accompanied by a complete loss of appetite and a marked despondency, followed by a sharp decrease in milk production. The symptoms vary considerably. A few cases have been observed in which a marked in-coordination was apparent on the day following parturition with no impairment of appetite until several days later.

From the results of experimentation by many workers on small laboratory animals as well as dairy cattle, it is possible to reconstruct the probable sequence of events in the development of ketosis in dairy cows.

When the food intake is in excess of the requirements for maintenance and milk production, the excess food energy is stored primarily as fat. In times of great stress when the energy requirements of the animal are suddenly increased, the fat cannot be burned rapidly enough to

supply this need. To compensate for this, nature has provided for an additional source of stored energy in the form of "animal starch" or glycogen, which is stored primarily in the liver.

Glycogen can be converted to blood sugar almost instantaneously. With the beginning of milk secretion, the sugar is removed very rapidly from the blood and converted into milk sugar in the udder. For this reason, an increased amount of sugar must be constantly added to the blood. This is probably obtained in part directly from the feed and in part from the liver glycogen. When milk secretion begins the sudden increase in the amount of blood sugar needed by the udder exerts a severe tax on the ability of the animal body to adjust itself to the increased demands. As a result it may be expected that much of the blood sugar at this critical period will be obtained from the liver glycogen. If the animal is normal this glycogen should be restored about as rapidly as it is removed and the blood sugar would be maintained at a normal level.

In ketosis, however, the dairy cow for some, as yet, unknown reason is unable to maintain a normal level of liver glycogen. This deficiency is apparent even before parturition and the onset of ketosis; with the beginning of milk production and the removal of large quantities of sugar from the blood by the udder, the liver glycogen becomes even more deficient. As a result, it may be presumed that the sugar is removed from the blood faster than it can be replaced and a decrease in the amount of sugar in the blood follows.

Our studies have shown that the udder of the cow with ketosis continues to remove a large quantity of sugar from the blood in spite of the lesser quantity available. This can only mean that other body tissues which depend primarily on the blood sugar for energy must obtain the needed energy from some other source such as fat. The accumulation of ketones is apparently the result of this increased burning of fat. In ketosis, the udder as well as other body tissues appear to burn an increased amount of ketones for energy, but the mobilization of these substances exceeds their removal from the blood, resulting in an excessive accumulation.

It is the belief of the author that the inability of the liver to maintain a normal level of glycogen, which appears to be a major factor in the onset of ketosis, is the result of an inadequate diet, particularly during the dry period.

The administration of dextrose, both intravenously and orally, has proved to be the most effective treatment for ketosis in cat-

tle. The glucose injected lasts about two hours and helps the animal to recover by supplying energy for the various tissues. By maintaining a high blood sugar level for a short time, the glucose injection also probably allows the liver to store glycogen. Feeding dextrose or molasses mixed with other feed stuffs also aids in the recovery from ketosis. When administered in this manner the sugar is added to the blood stream at a slower rate over a longer period of time due to the slower rate of absorption. Direct injections in the blood stream have been the most effective method of administering the dextrose, probably because of the resulting high level of blood sugar and the increased storage of liver glycogen.

Pumping from four to ten pounds of dextrose into the rumen has been effective in some cases, but too frequently such a practice results in further impairment of the animal's appetite.

Many of the more severe cases of ketosis can be avoided by early diagnosis and treatment. It is particularly important to prevent the cows from going completely off feed, or in the event that this has already occurred, to get them back on feed quickly. This can usually be accomplished by early injections of dextrose. In herds where the incidence of ketosis is high, it has been observed that the more severe cases can sometimes be avoided by putting the cows on full feed as rapidly as possible following parturition.

Because of the low blood sugar level and the effectiveness of dextrose and other readily available carbohydrates in the treatment of ketosis, many persons have suggested that ketosis is the result of a deficiency of soluble carbohydrates in the ration. However, we have had no success in our attempts to prevent ketosis by feeding liberal quantities of either dextrose or molasses before parturition. However, the feeding of some form of readily available carbohydrates such as dextrose or molasses for a few days before and for several days following parturition may help to avoid severe cases, as this is the period when the animal body must adjust itself to the increased demands of the udder for blood sugar and other substances. In fact, it may be wise to continue feeding some form of readily available carbohydrates for two to four weeks after the cow appears to have recovered, as it has been observed that the low blood sugar and high blood ketones frequently persist for several weeks after all symptoms have disappeared. Black strap molasses is fairly satisfactory when two or three pounds are fed per day. Corn sugar is better because more sugar can be fed in this form.

However it is more expensive.

Ketosis, which is associated with a low blood sugar and a normal blood calcium, should not be confused with milk fever which results from a low blood calcium. Calcium, in the form of calcium gluconate, is injected into the blood stream of cows suffering from milk fever because it supplies a readily available form of calcium and in a non-toxic form when the proper concentration is used. However, it is of little help in the severe cases of ketosis because the amount of calcium gluconate which can be safely injected does not provide sufficient glucose (dextrose). In those cases where ketosis is thought to be complicated by milk fever, calcium gluconate should be used. It should be followed, however, by an injection of dextrose. In more persistent cases of ketosis it may be necessary to inject dextrose once or twice per day for several days.

As there is a simple and rapid test available for the detection of excess ketones in the urine it is not necessary to depend entirely on the symptoms for diagnosis. This test requires but a few minutes and is used by most veterinarians.

Choral hydrate has sometimes proved effective in the treatment of ketosis when the animals were in a highly nervous condition. Treatment for ketosis should be carried out, of course, by or under the supervision of a veterinarian.

It is hoped that experiments now under way, which are designed to produce ketosis under carefully controlled experimental conditions, will lead to a solution of this problem in the near future.

Gets Brome Thru Drill

It is easy to get brome grass seed thru a drill if you mix it with phosphate, as William Carls, Shawnee County, Kansas, does. He uses it and 45 per cent superphosphate at the rate of 1 pound brome to 3 pounds phosphate. The drill feed is set to sow 15 pounds of brome and 45 of superphosphate an acre.

"The fertilizer gives it a quick start," he said. "I have a field seeded extremely early in the fall that was as thick and as large the following April as winter wheat. There was no place anywhere that you could find a skip in the row. I put it in as soon as the ground was dry enough to work after a good rain. The seedbed was firm and it came right up. Another field heaved during the winter because it was seeded on ground that was too loose."

—*Capper's Farmer*

Chickens Pay Their Way

Condensed from Farm Journal and Farmer's Wife

Ken Martin

THE best sample of good poultry management I have experienced in many a day is on the Petersham Road, a few miles from Athol, Massachusetts. There Harold Dalrymple and Beryl, his wife, are making a good living with chickens. Here's how you can tell:

Last year the egg average for their entire flock of layers (12 months of laying) was 208 eggs per bird. That's 57% production for the entire year. In producing those layers, they put 963 sexed pullets under brooders in spring, and housed 868 of them on September 1. During the 12 months' laying period 93 birds died, and 110 were culled out and sold for meat. The feed cost per bird in the laying house was $3.45, and the profit over feed cost on eggs was $3.32.

"How do you do it?" I asked the Dalrymples. In reply they showed me poultry and egg records complete to the last detail, and told me how they had managed year by year, starting eight years ago with 250 of the best chicks they could find. Out of the profits each year they have expanded, until this year they put 1,100 pullets in the laying house. They have followed literally that old poultry adage, "If you want to stay in the poultry business, don't *go* into it but *grow* into it."

To give you an idea how they have managed, take buildings. There wasn't much money for buildings, so, the first brooder and laying houses were built with walls of one-inch rough lumber covered outside with tough building paper held on with wooden strips or battens running up and down. Later, the outer walls were covered with drop siding right over the strips and paper.

Other houses were built and remodeled the same way, as the flock grew in size each year. There are now four laying houses and a modern double-decker, all piped with water and insulated. This year, a new brooder house with hot water will be added, so fall broilers can be raised.

"How do you keep losses so low?" I asked the Dalrymples.

"Brooder houses are ratproof and draftless," they told me. "Before starting chicks, houses are thoroughly cleaned and scraped to get rid of the old litter and dirt. Then we scrub the houses with hot lye water, and spray the walls with carbolineum. We start,

Reprinted by permission from the Farm Journal and Farmer's Wife, Philadelphia, Penna., April, 1943

regulate and run the brooder stove several days before chicks are hatched. At no time do we shut the brooder house tight. Chicks are never confined around the brooder too long. Each day the wire guard is moved, and at five days it is taken away entirely.

"Starting mash is put in small wooden hoppers around the hover before chicks are put in the house. Water is kept near enough to the hover to remove the chill. Fountains are washed daily and disinfected weekly. We are careful to see that no litter gets into the water or feeding mash.

"We have an alarm system and a bell rings in our home if temperature changes six degrees under the hover. On range, we have roosting poles under the trees. Hoppers are moved frequently to clean ground. We use an electric fence around the range to keep foxes and stray dogs away. The wire is six inches from the ground. To prevent weeds from grounding it, we put oil on the ground beneath the wire."

Pullets brought up this way have what it takes to make eggs when they get into the laying house. That's one reason why the loss of layers is so low.

Close culling most of the time helps to keep down losses of layers. A good retail trade makes it possible, almost necessary, to cull closely. Any bird that can't look the Dalrymples straight in the eye and show she'd rather lay than go into the pot, is a candidate for market right at the front door.

Along with close culling, there is careful and rigid selection of breeding stock. All pullets must be heavy, vigorous and big-type to get into the laying pens. All layers are mated for cross-bred chicks (Barred Rock males, Rhode Island females) until January. These cross-bred eggs are sold to a hatchery.

"Then we spend the whole month of January selecting the birds we want for our straight-run breeders," I was told. "First we examine the eyes, and choose only the birds that have orange iris with round pupil. We believe this normal eye helps to determine heavy laying and low mortality.

"We examine the combs—they must be fairly large, bright and waxy. Our emphasis on this eliminates crow-heads and small combs, which we believe are responsible for mortality.

"The last thing we go for is body weight, color and length of shank, which we like to have about four inches. We really believe this work we do in January is the reason our birds are so uniform in size and color.

"Cockerels used for breeders are chosen in the same way. As far as possible, the eggs we hatch

for ourselves are all graded 26 ounces; we use 24-ounce eggs for fillers. My hatches of straight-run eggs average 83%."

Finally, as I left the farm, I asked myself a question. "How many flock-owners could do as well as the Dalrymples?" And then I answered my own question this way: "A lot of them could, if they liked poultry as well, and would pay as careful attention to details. There is the secret of their success."

Soil Loss Secrets Revealed

Condensed from The Farmer

William H. Kircher

UNTIL Edgar Joy of the United States Soil Con-Conservation Service in South Dakota invented his wind tunnel there was no accurate way of measuring soil loss from wind erosion under various conditions at various wind velocities. Now the measuring can be done to ounces per acre if anyone should want to be that accurate, and a great deal is being learned about the effectiveness of various kinds of cover such as combined wheat stubble, corn stubble, sorghum stubble, etc., on soil which is inclined to move whenever there are high fall, winter or spring winds.

The tunnel is 32 feet long, three feet high and three feet wide. At one end is a motor-powered airplane propeller, and at the other a series of gauges to determine wind velocities at heights of 1 inch, 6 inches, 12 inches, and 18 inches above the ground surface. There also is a dirt-catching device connected by two pipes with a large vacuum chamber, and from this vacuum chamber the blown dirt falls into two receptacles, one containing the dirt removed from the surface up to a height of eight inches, and the other from the eight-inch height to 28 inches.

The motor-powered airplane propeller can be set to produce wind velocities up to 35 miles an hour. Among the first soil loss determinations made was a series on various kinds of stubble, corn stubble, sorghum, subsurface tilled short grain stubble, and subsurfaced combined grain stubble. In a two-hour test the corn stubble lost 3,300 pounds of soil an acre, sorghum stubble slightly less, subsurfaced short-cut grain

Reprinted by permission from The Farmer, F. S. & H., St. Paul, Minn.

stubble, 250 pounds per acre, and subsurfaced combined grain stubble only 50 pounds per acre. Most interesting comparison in these results was between the subsurfaced combined grain stubble and the exposed corn stubble, the latter losing 66 times more soil at a given wind velocity than the former.

This device proves accurately and dramatically what crop yields had previously proved about the effectiveness of cover in preventing soil loss, and about the effectiveness of subsurface tillage in providing for that cover, yet killing the weeds which would otherwise take moisture and plant food. If it were not for the war there doubtless would be large numbers of subsurface tillage tools going onto the farms this year. But though the tools are not available, the Soil Conservation Service workers are continuing their experiments with various kinds which they are making of parts from discarded machinery.

Newest of subsurface tillers is one with two 44-inch V-shaped sweeps or blades. These have an 8-inch overlap allowing for tilling an 80-inch width. Colters ahead of the sweep shanks cut through the surface trash so that there is a minimum of surface soil disturbance. This outfit is used immediately after harvest, and then the ground is not touched until grain is drilled through the trash with an ordinary disk drill in the spring. If row crops are to be planted, they are put in with planters designed for the job, and cultivation is done with a subsurface cultivator with sweeps which run beneath the surface in much the same manner as the tiller already described. Surface trash thus stays on the ground offering surface protection until the oncoming grain or row crop is high enough to protect the soil.

Although not so necessary in a wet year like 1942 these new weapons against soil and moisture loss are going to yield highly profitable returns when drouth years come again, and most certainly they will come.

"When disking or harrowing a field of any size, you can save time by starting diagonally from corner to corner," writes C. C. "The first couple of times across you will have short turns, but the length of turn will increase and the longer trips will gradually get shorter. This is easier on the tractor in turning. When the field is finished, it is done diagonally both ways, which leaves the ground in better shape than if fitted lengthwise or crosswise."

—Farm Journal

Prevent Colds and Shipping Fever

Condensed from The Kansas Stockman

Ray L. Cuff

Regional Manager, National Live Stock Loss Prevention Board

FOUR common, preventable conditions or practices which make feeder cattle more susceptible to colds and shipping fever by lowering their resistance are:

1. Over Fatigue
2. Over Crowding
3. Over Filling, and
4. Over Exposure

Preventing these four overs in shipments of cattle assures healthier and more profitable feeders and, therefore, more beef for the nation. Now, when an increased supply of beef is vital to winning this war, growers and handlers of feeder cattle should be doubly alert to prevent all avoidable losses, including those resulting from shipping fever. Shipping fever causes losses and slow gains especially in younger animals moved comparatively long distances in wet, cold weather. Proper handling, feeding and care will aid in preventing sickness and probable losses.

Research investigators are not in complete agreement as to whether shipping fever is caused by a virus or by a single organism or a group of organisms. Cattle of all classes and ages are susceptible to shipping fever. However, greatest losses usually occur in younger cattle whose resistance has been lowered.

"Shipping Fever" germs are found in healthy cattle everywhere, even on the farm and open range. But as long as an animal's natural resistance is normal, viruses or germs seem unable to produce the disease.

Of these four overs that lower the resistance of feeder cattle in transit and on arrival at farm feed-lots, fatigue seems most important, for "when fatigue is present, malignancy has its opportunity." Over crowding in transit especially on long runs is one of the surest methods of producing fatigue, sickness and losses. The practice of fasting for the purpose of overfilling cattle is unethical and not humane.

Many research workers advocate the vaccination of feeder cattle with bacterins or aggressins at least two weeks before shipment from the range to market. Such early vaccination is claimed to produce considerable immunity. Too few follow this practice.

Reprinted by permission from The Kansas Stockman, Jan., 1943

In 1933, the Kansas City Live Stock Market started experiments with common baking soda for the control of colds and shipping fever in feeder cattle. During a three and one-half year period we mailed follow-up questionnaires to approximately 8,000 purchasers of some 166,000 feeder cattle and calves, requesting the buyers to report the condition of cattle on arrival at farms and two weeks later. The survey reports showed that at the end of the first two weeks only 1.51% of the cattle reported were out of condition and that from all causes, including shipping fever, there was a loss of less than one-fourth of 1%.

Baking soda helps animals resist fatigue, as less glycogen or animal starch is consumed by the system when a proper alkaline balance is maintained. Scientists state that sodium, one of the elements of baking soda, by stimulating certain glands raises the resistance of the body to colds and shipping fever.

However else baking soda may aid in maintaining health of feeder cattle, we know definitely that soda given at the rate of two ounces per hundred-weight acts as a mild laxative. If soda did nothing else for fresh arrivals than to stimulate elimination from both kidneys and intestines, it would pay well to feed it.

Reports indicate that best results are obtained in preventing colds or shipping fever when one ounce of soda for each hundred-weight is fed each day for a period of 14 days. This dosage should be doubled for animals showing any symptoms of colds or shipping fever. Smaller daily doses of soda appear to be less effective.

Common ways of giving soda are: in drinking water, mixed with feed, in boxes and administered as a powder or drench. It is advisable that feeder cattle be given the baking soda treatment before shipping, if possible, or immediately on arrival at the home farm. One of the easiest ways is to mix five pounds of soda to each barrel of drinking water or to keep enough mixed in the water so that soda can be tasted. Many farmers have a tank of soda water ready for new arrivals and give them no other water for the first two weeks. The taste of soda in water prevents thirsty fresh arrivals from taking on too much water too quickly.

Many cattle feeders feed one ounce of soda per hundred-weight per day, mixed with the light feeds such as oats, bran or silage. This mixture is fed to fresh arrivals the first 14 days.

Others put soda in a box in some dry, protected spot and keep it available throughout the feeding period. Many report that this method of handling aids in

the prevention of bloat and helps to get cattle on feed better and faster.

Give sick calves or cattle two ounces of soda per hundred-weight per day as a powder or drench. In our experiments we gave single doses up to four ounces per hundred-weight. More than two ounces per hundred-weight per day acted as a fairly strong laxative. The simplest and safest method of giving baking soda is to place three separate handfuls of soda well back in the mouth of a sick animal. Do this by restraining the animal without wasting its energy by rough handling. Handle sick animals as little as possible.

Experienced veterinarians can give effective service in treating shipping fever, especially in the earlier stages. Injections of large doses of protective blood serum, 50 c.c. or more, and the use of other tried preparations such as some of the sulfa-drugs oftentimes gives good results. Soda supplements most treatments of colds.

Milkweed: Industry's New Baby

Condensed from Nation's Business

Grace V. Sharritt

IF the Japs had not prevented the exporting of kapok from Java, the milkweed's sudden rise to industrial status in America might have been long delayed. But kapok *was* cut off and the United States Navy had to find a substitute—fast.

The Navy knew where to look for floss. It turned to the newly-formed Milkweed Products Development Corporation of Petoskey, Mich., headed by Dr. Morris Berkman, a Russian refugee.

Through his experiments, Dr. Berkman discovered latex in the milky stalk, but not enough to warrant its development for rubber alone. In these same coarse stalks, he found the base of a new plastic, which could be used in manufacturing women's stockings, insulation wall boarding and paper pulp. He learned that:

The lowly milkweed's seeds contain valuable oil; the pod shells could be used in making linters for explosives—and the floss had what the Navy needs today, a warm, waterproof inner-lining, embodying the life-preserving qualities of cork, for use in seamen's jackets and flying suits for pilots.

Reprinted by permission from Nation's Business, Washington, D. C., April, 1943

Just 22 ounces of milkweed floss can keep a sailor afloat for 100 hours in salt water. A flying suit in which this floss was used was chosen as one of the ten inventions submitted to the National Inventors' Council.

Getting into operation was no snap to Dr. Berkman. He let 600 contracts to organizations and citizens to pick the milkweed crop in wild lands around Petoskey, which hitherto has been known only as a resort town for hay-fever sufferers. The populace turned out *en masse* to recap the green pod harvest, for which $50 a ton (dried) was paid.

The Government has taken all the corporation's output for the duration, with the first year being used for testing mainly. Dr. Berkman has constructed and patented three sets of machines to gin the floss and separate the seeds from the pods.

Dr. Berkman believes that oil mills and other industries may spring up as a result of his discoveries. He has invented a bed pillow of milkweed floss for those who are allergic to feather pillows and he can think of dozens of other uses for the components and derivatives of milkweed.

The company, as a matter of fact, already has a contract with a sporting goods manufacturer for 50,000 pounds of milkweed floss to be used in making baseballs after the war. The future looks rosy for the milkweed.

Grain for Cows

How accurate are rule-of-thumb methods for feeding grain to dairy cows? I refer to the recommendation to feed 1 lb. of grain to from 2½ to 4 lbs. of milk, depending on its richness.

In general this rule gives the high producers too little and the poor producers too much. One way to overcome this disadvantage is to weigh the milk and increase the grain given to each cow so long as it results in a satisfactory increase. This will give the cow an opportunity to produce up to her inherited capacity.

Another rule sometimes used is to give Holsteins .4 lb. of grain for each pound of milk over 16 lbs.; give Ayrshires and Brown Swiss .45 lb. of grain for each pound of milk over 14 lbs.; give Guernseys .55 lb. of grain for each pound of milk over 12 lbs.; and give Jerseys .6 lb. of grain for each pound of milk they give over 10 lbs.

Thin, Weedy Pastures Need Attention

Condensed from Farmer's Magazine

N. J. Thomas

THAT meat and milk can be produced three to four times more economically on pastures than under barn feeding conditions has been well established. Some of the reasons for this are that good pasture is a highly nutritious, well-balanced feed and that there is little, if any, labor cost for harvesting. In view of the present urgent necessity for meat and milk products and the scarcity of labor and fixed prices, good pastures are required as never before if a fair margin of returns is to be expected.

The method of obtaining good pastures will largely depend upon soil conditions, type of sward, and also the farm's individual requirements and ability to accomplish the necessary work entailed. Where land is readily ploughable and time and equipment are available, it is more economical to plough, crop and reseed thin weedy pastures rather than improving by top dressing with fertilizers or manures.

In 1930 the Ontario Agricultural College took over 30 acres of a typical worn out, weedy pasture. The field was seeded down about 40 years ago and either rented for pasture, hay cut off or just left idle according to the demand. Blue weed, oxeye daisy, buttercup and moss were all mixed together with a thin stand of Kentucky and Canada blue grasses, some timothy and yellow trefoil. The soil is a well-drained gravelly loam and quite uniform.

Five 4-acre plots were established and treated as follows: Plot 3—no fertilizer. Plot 4—320 lbs. of 20% superphosphate and 200 lbs. of 50% muriate of potash per acre every three years. Plots 1 and 2—the same mineral treatment as plot 4, also 400 lbs. of nitrogen as ammonium sulphate per acre every year. Every plot was kept mowed and harrowed. After 5 years of results plot 1 and an additional plot (No. 8) were ploughed, fertilized and reseeded with a hay-pasture mixture. The pastures were stocked with dairy cows and heifers, pasture days were recorded and yield of dry matter obtained from areas protected from grazing.

The following results were obtained from an average of seven years' treatment (1931-37) of the natural blue grass pasture and an average of two years (1936-37) from the reseeded pasture.

Reprinted by permission from the Farmer's Magazine, 73 Richmond St., West, Toronto, Canada, Feb., 1943

Plot 3—no fertilizer—produced 1200 lbs. of dry matter per acre annually with an average of 5.5% protein and 6% ash.

Plot 4—minerals only—yielded 2000 lbs. of dry matter per acre with an average of 9.9% protein and 7% ash.

Plot 2—minerals plus annual applications of nitrogen—yielded 3250 lbs. of dry matter with an average of 11.7% protein and 6.3% ash.

Plot 1—for the first 5 years in a natural sod and treated as plot 2, averaged 2600 lbs. of dry matter per acre containing 15% protein and 8% ash. The following two years after reseeding this same plot averaged 8150 lbs. of dry matter per acre containing 18% protein and 8.5% ash.

The adjoining plot 8 also ploughed, summer fallowed and re-seeded yielded 9100 lbs. of dry matter per acre containing 18.3% protein and 8.6% ash.

From the above figures all fertilizers increased the yield over the untreated plot 3. The minerals on plot 4 gave a 75% increase in yield of dry matter with an extra 4.4% protein in the pasture. Clovers predominated in the sod with a 50% reduction in weeds.

It is quite apparent that the annual applications of nitrogen greatly increased the yield of dry matter which consisted almost entirely of grasses and a mere trace of clovers. The very thick sod practically smothered all weeds which proves that this is the best method of controlling weeds in pastures. Yields were increased nearly 175% over plot 3 with over 6 times as much protein produced per acre.

The most striking increases were obtained from the newly seeded pastures. Yields of dry matter were over 2½ times greater than the heavily fertilized natural pasture with 4 times the total yield of protein per acre and over 7 times the yield of dry matter produced on the unfertilized plot of old blue grass.

Another very important point was observed with the reseeded pastures compared with the fertilized blue grass pastures. That is, the yield of grass was well distributed throughout the grazing season which provided considerable grazing during the hot summer months. Whereas on the blue grass sod very little grazing prevailed in August and September. While the total yield of blue grass pastures can be increased by fertilizing it is rather difficult to affect the length of grazing season because, except under very favorable weather, growth of blue grass pastures will decline just when it is required. In general blue grass pastures produce approximately 65 to 75% of their total season's production by the end of June leav-

ing very little grazing for midsummer and autumn.

When reseeding pastures a mixture of grasses and clovers should be included that will provide uniform growth throughout the season. Deep rooted legumes and drought resistant grasses help materially in producing uniform grazing which reduces the necessity for expensive emergency pastures. Moreover, grasses and clovers grown in association with each other always do better when grown alone.

Best results are obtained from top dressing hays and pastures with fertilizers or manures when there is a good thick sward of productive grasses and clovers. Under such conditions outstanding and profitable results have been obtained. As low soil fertility is partially responsible for many of our non-productive pastures even thin weedy pastures can be greatly improved by such treatment. Sods will thicken and the very small clover plants will develop remarkably fast when properly fed. Having obtained a good foundation through the first application of fertilizer the second application of fertilizer will often give results that are profitable providing the soil is retentive of moisture and plant food and the grasses and clovers present are productive.

Solving the Machinery Shortage

Condensed from The Western Farm Life

V. Goertzen

ONE of the first major constructive steps in solving the acute shortage of new farm machinery was taken in Magic Valley, Idaho, this past winter. Magic Valley is the chamber of commerce name for the large irrigated tract, incorporating all or parts of eight counties in south central Idaho. There the farmers, together with the USDA war board, the chamber of commerce and the extension service, organized and sponsored a used farm implement auction day, staged in Twin Falls.

While touring the rural areas in connection with the farmers' 1943 food-for-victory program, Bert Bolingbroke, Twin Falls county extension agent, made a survey which revealed that practically every farm in southern Idaho had at least one or more

Reprinted by permission from Western Farm Life, Denver, Colorado, April 1, 1943

items of usable farm machinery that was used only occasionally or not at all. And from this survey, Bolingbroke conceived the idea of an auction to redistribute this machinery, estimating that such a sale would net the owners approximately $15,000.

On the day of the sale more than 1,050 items of machinery and accessories, from fence posts to tractors, had been assembled to overflow the block-long yards of a local implement company. Opening at 10 a. m. the sale got underway with three auctioneers —working in various sections of the yards. This enabled the farmers to buy more rapidly those articles in which they were most interested. During the first 2 hours of the auction more than 200 pieces of equipment were snapped up.

The aggregate of the sale was $14,900. "The farmers themselves deserve a lot of credit for this success," explained Bolingbroke. "They displayed their patriotism by bringing in their machinery for sale so that it could get into the hands of other farmers, who needed the implements to meet crop goals in the food-for-victory campaign."

As a result of avid bidding, farmers were forced to pay slightly more than used farm machinery brings generally, but they all seemed well pleased to get it. None of the four tractors, however, brought ceiling prices, consequently, farmers were not forced to draw straws to decide the successful bidder under price ceilings.

All of the more than 1,000 farmers who attended the machinery day auction needed implements badly. One farmer must have been in desperate need of a beet and bean four-row cultivator to help grow America's war crops, as he paid $295 for it. A check-up showed that the implement originally cost only $135.

Even during the noon hour many of the farmers did not leave the lots but grabbed a snack at the Red Cross canteen and bid on a merchandise-war bond auction. Merchandise items went free to those who purchased their bid prices in war bonds. At the war bond sale, one lamb brought $500, while a pound of coffee sold for $100. These were just two of the features that sold thousands of dollars worth of victory bonds.

"It was the greatest sale ever held in southern Idaho," said Harley Williams, implement dealer, "with everything bringing good prices, and owners receiving the entire proceeds from their machinery."

Bolingbroke expressed the belief that this idea should be adopted nationally to benefit the farmers throughout the country.

Give Them Better Grass

Condensed from Everybodys Poultry Magazine

John Vandervort

GOOD grass ranges will mean more to poultry raisers in 1943 than in any previous year. Those who have paid particular attention to providing green ranges for growing stock report that birds consume less purchased feed.

Green, tender, succulent grass is a good source of vitamin A and riboflavin. In addition grass furnishes protein and minerals. Chickens 8 weeks of age or older that are on range and consuming large quantities of green feed can be given a ration without the special ingredients that supply vitamins A and D and riboflavin.

By a good range is meant one that will supply green, succulent, palatable, and nutritious feed throughout the growing season. One must keep in mind that the value of the grass from the standpoint of vitamins, protein, and minerals will vary with the kind of growing season and management of the range.

Some have the idea that a new seeding with a special type of grass mixture is necessary before a satisfactory grass range can be supplied. Pennsylvania poultrymen have provided good ranges by using meadows already seeded with timothy, red or alsike clover, alfalfa or a combination of these. Though this type of sod may not be as satisfactory as some others, it may be the most practical and economical way of providing range, particularly on general farms. With some types of range it is possible to improve them through the wise use of lime, fertilizer and, sometimes, by introducing a seed mixture at the proper time, particularly in the case of a thin sod.

Established bluegrass pastures for livestock offer another possibility for a good poultry range. The combination of bluegrass and native white clover makes a most palatable, nutritious feed. As in the case of old meadows, proper liming and fertilization may be necessary in order to provide a heavy covering of grasses that are palatable and nutritious.

To get the most from a poultry range or pasture, it must be properly managed. This means mowing in addition to the wise use of lime and fertilizer. It is necessary to keep the grass from getting too tall. Tall grass, approaching maturity is not so palatable nor nutritious as the tender succulent growth that

Reprinted by permission from Everybodys Poultry Magazine, Hanover, Pa., Apr., 1943

starts after mowing. Then, too, chickens do not range well in a field of tall grass. If it lodges the ground is likely to remain damp as the sun cannot reach the soil to dry it out. This is conducive to the growing of slugs, snails, and beetles, which may serve as hosts to tapeworms and aid in bringing about an infestation of these parasites.

Before pullets are placed on a meadow seeded with the common legumes and grasses, it should be mowed and the hay removed. If it is not practical to cut the field for hay as early as one wishes to have pullets on range, strips where the shelters or brooder houses are located should be mowed.

On farms laid out in strips on the contour to prevent soil losses from erosion, strips of sod alternate with strips of grain and corn. Both grass and shade are provided, the shelters being placed on the sod. Pullets of different ages can be kept separate with this system.

During the past three years, poultrymen in at least a third of the counties in Pennsylvania have established Ladino clover pastures for growing stock. These ranges have been seeded with this seed mixture or ones very similar.

Seed Mixture	Lbs. per Acre
Kentucky bluegrass	6 to 8
Perennial ryegrass*	8 to 10
Redtop	2
Ladino clover	2
White clover (Louisiana, New Zealand, or Corn Belt)	1
Total pounds per acre	19 to 23

*Domestic ryegrass may be substituted if desired.

Where such ranges have been successfully established with Ladino clover predominating, the owners are enthusiastic about them. There are reasons for this attitude. In the first place, such ranges have provided an abundance of green feed for as long as six months each year. In Lycoming County in the spring of 1942 early pullets placed on range April 20 had an abundance of green feed. These were moved to laying houses in August and late ones put in shelters. Though frosts kept the grass from making good growth, there was still green feed available for the birds in late October.

Another advantage of Ladino clover as compared to other legumes and grasses is the tendency to provide green succulent growth even during the hot weather of July and August.

To my knowledge no research work has been done to determine accurately the savings in feed consumption when pullets are on a good range. Those poultrymen having Ladino ranges usually mention the fact that pullets eat less purchased feed. Statements from growers indicate a possible saving of from 10 to 35 per cent in purchased feed. In 1941 with

2,500 pullets on 9 acres of Ladino ranges, Stanley Barclay, Lycoming County, Pa., estimated a saving in feed costs of $4.00 per day.

Poultrymen like the way that Ladino covers the ground. They remark that there are few bare spots, and these are confined to a small area around the shelters.

Growers generally state that the quality of pullets is as good or better than those grown on unimproved ranges.

Satisfactory stands of Ladino have been obtained by seeding (1) without a nurse crop in April or August, (2) with winter grain, sowing the grasses preferably in the fall with wheat or barley and the legumes in the early spring, or (3) with spring grains.

In establishing a new range, emphasis should be placed on preparing the seed bed well. The proper amount of lime, as determined by a soil test, should be applied and a liberal amount of complete fertilizer used.

Under good management, a Ladino range will last indefinitely. By good management is meant, first of all, frequent clipping. Under normal growing conditions, this means about once a month during the growing season. Walter Shaw, Delaware County, with three years experience with Ladino clover has clipped his as many as six to eight times a season. The clover is mowed when it reaches a height of from 5 to 8 inches. The clippings are left on the ground.

Another important consideration in maintenance is fertilization in the fall with about 400 pounds of superphosphate or phosphate-potash mixture to the acre every other year. It may be necessary to top dress with lime once in four to six years, the amount to be determined by a soil test.

How soon a field can be pastured after seeding should be determined by the growth of grass. This will depend on the weather conditions after seeding. Generally the grass can be pastured when reaching a growth of about 4 inches. A pasture seeded in April may be pastured in June if the weather has been favorable.

The carrying capacity of a range will depend on many factors including the quality of the sod, the fertility of the soil, the weather, the management of the range and the size of birds. The poultryman himself will have to determine the optimum number per acre after considering all of the above factors. Three hundred pullets per acre may be a sufficient number for a meadow, a hay field or an old livestock pasture. Those who have had experience with Ladino clover seem to feel that an acre will carry 500 pullets during a large part of the growing season. Some have placed more than this number on range

during the months when grass grows fastest.

One should keep in mind that the growth of grass slows up in the fall when frosts appear, and too many pullets would likely pasture the range too closely. Large bare spots would appear and the grass would be slow in getting a good start in early spring. Close, late pasturing tends to encourage winter killing.

One should keep in mind that pullets of laying age will pasture the range more closely, and fewer birds of this age should be allowed per acre than in the case of ones 10 to 20 weeks old. On farms where excellent range is available, consideration should be given to leaving at least a part of the early pullets on range during the summer months so that they will have the advantage of green succulent feed over a long period of time.

Moving Shelters

Whether one uses the same range for chickens year after year will depend on the type of range. On general farms where a definite rotation is established, chickens can fit into the regular rotation and be placed on the fields used for hay. With this system, they are on clean range each year.

Those who have established so-called permanent sod such as bluegrass or Ladino clover, especially for poultry, are inclined to use the same field each year and leave the shelters in the same locations. On this kind of a range poultrymen do not like to move shelters as it increases the number of bare spots. Then, too, moving shelters frequently is another task that one may want to avoid, especially with a shortage of labor.

One can encourage pullets to get away from the shelters and use all parts of the range by changing the location of movable hoppers and waterers occasionally.

Rape and Oats for Pasture

"There is no better and quicker green crop for pigs than rape," says Roy E. Coulter, Westville, Indiana. He uses it with oats.

"Rape must not be pastured too soon, or the pigs will pull it up by the roots," he says. "Let it get several inches high before turning pigs into it. In seeding, I drill oats, about two bushels an acre, then broadcast the rape, says five pounds per acre. Five acres of rape used this way is practically inexhaustible for 50 shotes and three or four yearling calves that also have the run of the field."

—*Farm Journal*

Preparing Rabbit Meat for the Table

Condensed from New Jersey Agriculture

Willard C. Thompson

Professor of Poultry Husbandry

PROBABLY the more or less widespread prejudice against rabbit meat may be traced to the unattractive way in which wild rabbits, shot by hunters, have been presented to housewives for use in the kitchen. Too often the carcasses have been brought in, or offered at the market, just as the hunter has left them, with furs or pelts still intact, except for the bloody wounds which have been all too evident. It may have been a considerable length of time since the animals were killed, and the carcasses have been stiff and ugly in appearance.

The domestic, grain-fed rabbit is, however, an entirely different offering. Its flesh is practically all white, fine-grained, tender, nutritious, and wholesome. It can be presented to the housewife in an attractive form, without head, feet or fur, and fully dressed. It should be so prepared for the kitchen or market.

Let's outline a method of killing, dressing, and packing the domestic-grain fed rabbit — the rabbit which may be raised in the barn or backyard and is destined for the use of the immediate family.

The frier rabbit, undoubtedly the most delicious grade of rabbit used for meat, should be prime for slaughtering when from 2 to 3 months old. The flesh will be tender, juicy, and of highest quality in so young an animal. Older and more mature rabbits may, of course, also be used for table meat. The frier will probably weigh between 3½ and 4 pounds at this stage of development.

Rabbits are killed in either of two ways. One method is to strike the rabbit with a blunt, heavy stick just behind the ears, dealing a quick, heavy blow which will immediately kill the animal. The other method is to grasp the hind legs firmly with the left hand, and then with the right hand hold the chin of the rabbit backwards, held by the fingers of the right hand; then by quick, firm downward pull the neck is dislocated. The head has been thrust backward at almost a right angle to

Reprinted by permission from New Jersey Agriculture, New Brunswick, N. J., March-April, 1943

the backbone line, thus making such dislocation quick and immediate.

After the rabbit has been killed, it should be hung immediately, by the hind legs; and the legs should be separately caught, through the tendons near the knee joints, on nails which are about ten inches apart. This presents the carcass in form for easy skinning. Place the belly of the rabbit to the front. As soon as the rabbit is hung securely, cut the throat with a sharp knife, or sever the head entirely—so that the blood will drain thoroughly. As soon as the bleeding has practically stopped, the skinning of the carcass should be undertaken. It is important to dress the rabbit carcass as soon as possible after killing.

With a small-bladed, but very sharp knife, begin the process of skinning by cutting the skin around each hock or knee joint in the hind legs, and slitting the skin from the joint down to the anus, along the inner side of each hind leg.

Loosen the skin around each hock joint, and also around the neck, if the head has not been severed, and around each front leg.

Next start the removal of the pelt by reversing it and peeling it down over the body. The pelt should be most carefully handled, so that it will not be torn. The use of the knife occasionally next to the carcass will facilitate the removal of the pelt.

Slit the abdominal wall, beginning near the anus, cutting around it and following down the middle to the neck.

Remove the entrails completely, which will be found to be easily and readily accomplished.

Wash the carcass in cold water very thoroughly, clipping off rough edges of muscle or bone, to make the carcass attractive in appearance. Let the carcass drain and dry, or wipe it dry with a clean cloth.

Next prepare the carcass for the kitchen or for the table. Some prefer to leave the carcass in one whole piece, letting each housewife cut it into such pieces as she may wish. Others cut it into pieces ready for frying and pack the pieces.

In either case the rabbit meat thus prepared should be wrapped in wax paper and boxed, or bagged, as the case may be, for transfer to the kitchen. Of course, the meat should have been perfectly cooled before it is packed. Ordinary usage dictates that the rabbit frier carcass should be cut into 9 pieces. The lower joints of the hind legs make pieces 1 and 2; the upper, meaty parts of the hind legs furnish the 3rd and 4th parts; the back section, heavily meated, is cut into three pieces of about equal size and straight

across; the front legs make the remaining two parts.

Home-grown rabbit meat may be killed when prime and the dressed meat pieces or whole carcasses wrapped in cellophane or wax paper and quick-frozen and held indefinitely.

Emergency Feeding Hints

Condensed from Guernsey Breeders' Journal

W. E. Krauss
Dairy Dept., Ohio Experiment Station
Chairman Committee on Milk, Food and Nutrition Board, National Research Council

IT is fortunate that the demands now being made on dairymen for more and more production did not come a hundred years ago. There wasn't much to the dairy business then. Each farmstead had a few cows that were housed in the winter, when they were usually dry, milked when convenient, and fed whatever happened to be available, grass during the summer, and a little grain, straw, roots and potatoes during the winter. Later when corn was common, many cows wintered on corn fodder and a straw stack. The milk was consumed as such by the family or as butter and cheese, except in the case of large herds in the native pasture regions.

A good cow in those days was expected to produce about 160 lbs. of fat in a year. The highest record known was 12,000 lbs. of milk a year, and the average yearly production was about 2,000 lbs. Breeding and feeding were haphazard. There was no farm machinery; there were no silos; there was no alfalfa; there were no soybeans; there were no commercial fertilizers; there were no commercial feeds; there were no proved sires; there were no institutions concerned with improving the dairyman's welfare. The dairymen were on their own and cattle declined instead of improving until a few wise men imported cattle from abroad, kept them pure and bred for desirable characteristics.

As a result of improved breeding, inventions, research and teaching, the last hundred-year period has seen not only great gains in dairy cattle numbers, but improvements in breeding, management and feeding practices to the point where now, as these great demands are made, there is available the wherewithal with which to meet them.

The discussion that follows will be based on the fact that 60 per

Reprinted by permission from the Guernsey Breeders' Journal, Peterborough, N. H., April 15, 1943

cent of all the cows milked in the United States are in herds of 10 cows or less and are owned by 90 per cent of the farmers who milk cows, and that on Ohio farms of this kind 75 per cent of the labor is done by the operator and his family. Still another assumption will be made, namely, that the dairy industry will maintain its prominent position for some time after the war. It is intended, too, to limit this discussion to feeding.

Green feed is the natural food for cows. Let us start, then, with pasture feeding. The term "pasture" to most farmers means a permanent area containing some blue-grass onto which cows can be turned early in the spring and left until late in the fall. Now blue-grass is an excellent feed when there is enough of it, but our summer seasons are such that in most years blue-grass pastures are poor in July and August and sometimes earlier and later than that. Cows that are expected to depend largely on blue-grass pasture usually will drop off in milk after the spring flush. To prevent this drop in milk would make a big difference in the output of milk during the summer months. Feed is required to do this—grain particularly to supply the energy it takes to produce milk, and, when available, hay and silage to balance things up.

Of course the thing to do in a permanent program is enter into a pasture improvement scheme and provide good legume pasture which if properly grazed will provide good feed all during most summers. To offer supplementary feed to cows on any kind of pasture any time is not a bad stunt. If the cows eat it readily, they probably need it. Certainly, some bonemeal and salt should be made available when cows are depending largely on green feed. And it isn't necessary to try to get your cows out first in the spring and in last in the fall. This doesn't do the cows or the grass any good. Incidently, cows appreciate shade. This doesn't mean that they need to graze a woodlot; it may pay to build a movable shelter.

Then comes barn feeding—the period during which hay, grain and silage are fed or hay and grain alone. Good quality hay will be more important than ever this year. Because animals of all kinds are being fed better than ever, the demand for protein feeds is so great that it may not be possible to get the protein feeds as readily as in the past. The man with legume hay has a big advantage here because his hay contains much more protein than ordinary mixed hay or timothy and he can do a good job with a lower protein grain mixture. The teaching that has been done for many years regarding

the value of legume hay certainly applies now. Alfalfa-timothy mixtures are about as good as straight alfalfa, and there are some advantages of the mixture over the straight legume. Those who have mixed hays will be ahead from a protein standpoint by cutting these hays early.

Just to have a crop in the field does not mean it can be counted on to supply calculated quantities of feed nutrients. There are harvesting risks and losses that must be reduced to a minimum. Exposure to weather is hard on hay even though this may increase the vitamin D content. Bleaching lowers the vitamin A content and makes it easier for the leaves to shatter. Leaching with rain washes out some protein and B vitamins. When hay has to stand in the field cock-curing conserves nutrients; when wet weather seems certain and there is silo space ensiling the crop will prevent considerable and often total loss.

This raises the question of silage. Corn silage is hard to beat. Cows like it and it probably helps keep them in condition. It will produce as much milk as alfalfa silage if extra protein is supplied in the grain when the comparison is made. Grass silage has its place, too, especially when the hazards of harvesting a first-cutting legume are to be avoided and right now we are interested in maximum conservation of nutrients.

That brings us to grain mixtures. The chief function of grain mixtures is to supplement what the roughage supplies and make the entire ration complete if the roughage itself is not. Energy, expressed as total digestible nutrients (T.D.N.), protein and phosphorus are the things contributed by the grain mixture. There was a time when bulk was thought to be necessary but this seems doubtful. So long as the mixture is palatable and contains the amount of protein desired the usual feeds that go into grain mixtures can be combined in many different ways, no one of which can be said to be best. Shelled corn, corn-and-cob meal, oats, bran and one of the oilmeals are the principal constituents of home-mixed dairy grain mixtures fed in Ohio. When necessary, wheat, barley, or rye may be included; corn, oats, bran or the oilmeal may be left out. Available supply, cost, personal likes or dislikes, as well as actual need, enter into the decision as to what feeds and combinations have been used. The goal usually has been to supply a certain amount of protein in a combination the cows would like. There is nothing wrong with this method, especially when it is remembered that the cow has a rumen capable of manufacturing

the kind of protein she needs if she is supplied with enough feed protein to work on. This suggests that grain mixtures for cows can be quite simple and indeed the evidence is pointing in that direction.

There is a little more to feeding cows than giving them so much pasture, hay, silage and grain. Thirty years ago the word "vitamin" was coined. It was some time after that before we ever heard of vitamins for dairy cattle. Now we know definitely that these animals must have in their feed vitamins A and D. Vitamin A is supplied by hay, silage, pasture and yellow corn; Vitamin D by exposure to sunlight and by feeding sun-cured hay. From the middle of winter on in to pasture season the intake of vitamin A may be low since carotene (from which vitamin A is made) is lost from hay as it lies in the mow. Corn silage has a fairly good supply of this yellow pigment and good grass silage usually contains quite a lot of it.

So long as cows get good sun-cured hay they probably get enough vitamin D. It is possible that at certain times, for example, just before and just after calving, they need more than natural feeds supply. Any herd bothered considerably with milk fever might consider feeding some irradiated yeast at this time.

Apparently we don't need to worry about any of the many factors of the B-complex so far as cows are concerned. That wonderful organ, the rumen, seems to be able to manufacture all that is needed.

We can't forget minerals. The story hasn't changed much recently. Calcium, phosphorus and iodine still are the ones to watch. Legume hays and legume mixtures are the principal sources of calcium; whole cereal grains and the oilmeals are good sources of phosphorus; and iodized salt of the new stabilized variety will just about automatically take care of iodine needs. Some think the feeding of one or two per cent minerals in the grain mixture is cheap insurance under all conditions. We know from experience that cows will eat quite a bit of bone-meal out of a box even when they are on good pasture, so it would seem to be a good thing to see that cows have free access to salt and minerals during the pasture season. In some sections of the country where the soil is known to be deficient in such minerals as iron, copper, cobalt, or manganese, these must be supplied as supplements, for crops grown on deficient soils also are deficient.

As to how best to feed these things we have been discussing, in times like these when milk is needed and the price of milk is good, the best advice would seem

to be to feed more heavily than usual. Allow the cows to eat all the good hay they will eat, feed silage moderately, and feed a little more grain than you usually do. If you have the labor and the feed to do it feed and milk three times a day. You will be surprised at how much more milk some of your cows will give on such a schedule.

Since the big demand for milk probably will continue for some time, special attention should be given to growing out the young animals that will be your producing cows in a year or two. Regarding heifers, there is one particular point we would pass on at this time: feed them grain. The chances are if you do that they'll be bigger cows and produce more milk. Heavier grain feeding for calves also is in the picture now, especially if limited amounts of whole milk and skim-milk are to be fed. The critical period in a calf's life is the first six weeks. During this time whole milk should be fed and the calves should be taught to eat hay and grain. Because the calf is born with little, if any, storage of vitamin A and D and because the cow's milk is often only a poor source of these factors, some extra vitamins A and D should be fed during the first two months or until the calves are eating a pound or two of good hay. Fish liver oils can be used as sources of A and D, and irradiated yeast or activated animal sterols can be used as sources of D only. After the calves have a good start on whole milk and have learned to eat hay and grain and drink water, the milk can be dropped out if the grain mixture contains at least 20 per cent protein and 2 per cent minerals (calcium and phosphorus). Such a system of raising calves will save one or two hundred lbs. of whole milk and 1,000 or more lbs. of skim-milk per calf. Milk saved this way is just as valuable as that resulting from increased production.

Meeting the Protein Shortage on Dairy Farms

Condensed from Farm Research

F. B. Morrison

IT is now generally known by farmers that there is at present a serious shortage of protein-rich feeds, or protein supplements, for livestock. This shortage has been brought about largely by the considerable increase in numbers of livestock, especially hogs, on the farms of the United States, and to better feeding of stock than usual by many farmers.

The increase in our livestock population is urgently needed to meet the wartime demands for animal products by our armed forces and our allies, in addition to our civilian needs. Some farmers, especially in the grain-growing districts, who have not been in the habit of feeding their stock enough protein supplements for most efficient production, are now attempting to feed their animals better than ever before. They are doing this partly because of patriotic response to the demand from the nation for more food and partly because the prices for livestock products are now more favorable than a few years ago.

There is also a lessened production of some protein supplements, especially fish meal, because of war conditions. Other influences, too, have caused the present shortage.

Because of the seriousness of the shortage, the Feed Industry Council, representing the feed manufacturers and feed merchants of the country, in co-operation with the United States Department of Agriculture and nutrition experts from some of the state agricultural experiment stations, has worked out a program for conserving protein feeds. Under this program, the feed industry agrees to try to hold the protein content of mixed feeds and livestock rations within certain maximum amounts. The program is a voluntary one, and depends for its success not only on thorough co-operation by feed manufacturers and feed merchants, but also by farmers.

The whole object of this program is to use the available supply of protein most efficiently and to cut out any wasteful use. It is essential that we all do our utmost to help make the limited supply "go around" so it will produce just as much human food as is possible.

For dairy feeds the program makes the following definite statement: "Limit total protein

Reprinted by permission from Farm Research, Geneva, N. Y., April, 1943

content of dairy feeds to 16 per cent as fed to the cows, except in cases where only grass hay, cereal hay or fodders, or silages made from the same crops are available, when 18 per cent is permissible, with tolerance not to exceed 1 per cent. Where legume hay is available, the protein content of the dairy feeds as fed to the cows should be limited to a grain ration containing from 12 to 16 per cent protein — depending upon the quality of the hay."

Many New York dairymen have been in the habit of feeding grain mixtures considerably higher than this in protein. However, we can assure them that these recommendations provide enough protein for satisfactory production. We feel safe in making this statement because of the results of extensive experiments conducted by Professors E. S. Savage and E. S. Harrison at Cornell a few years ago, and also because of the results of experiments conducted elsewhere.

In the Cornell experiments a grain mixture containing only 16 per cent protein gave entirely satisfactory results when fed with corn silage and mixed clover and timothy hay containing at least 30 per cent clover.

In two earlier experiments by the author and associates at the University of Wisconsin, dairy cows produced just as much milk and fat on a home-grown ration consisting of an abundance of good alfalfa hay and corn silage for roughage as when a mixture of linseed meal and cottonseed meal was substituted for part of the corn and oats. The corn and oats mixture had only 11 per cent protein.

In two somewhat similar experiments by Professors Savage and Harrison at Cornell, cows fed alfalfa hay and corn silage for roughage produced as much milk and maintained their live-weights as well when fed a grain mixture of ground barley and ground oats, with 10 per cent of wheat bran, as when fed a higher-protein mixture of cottonseed meal, barley, and oats. On the average, the daily production on the low-protein mixture of barley, oats, and bran was 29.6 pounds of milk daily, containing 1.20 pounds of fat, in comparison with 28.1 pounds of milk and 1.14 pounds of fat on the mixture containing more protein.

In feeding poultry and pigs, just as with humans, the kind or quality of protein is of fully as much importance as the amount of protein. It is impossible to make a satisfactory ration for poultry or pigs or a satisfactory diet for humans, unless it contains at least a certain amount of high-quality protein, such as is furnished by milk and certain other animal products.

By high-quality proteins we

mean proteins that are rich in certain amino acids—the building stones of the proteins—which are required by these animals, but which are not furnished in sufficent amounts by the cereal grains, such as corn, wheat, oats, or barley. Unless humans, poultry, swine, dogs and other animals with simple stomachs receive in their food an adequate supply of these essential amino acids, they cannot thrive.

Right now there is a definite shortage of high-quality protein supplements suitable for swine and poultry, and particularly of dried skimmilk, dried buttermilk, fish meal, meat scraps, and tankage. The best substitute among feeds of plant origin for these animal by-products is soybean oil meal. Fortunately, this can largely replace these scarce feeds for poultry and swine.

Fortunately, the quality or kind of protein in the ration is of much less importance for ruminants, such as cattle or sheep, than for animals with simple stomachs. This has been proved in recent metabolism experiments Professor J. I. Miller and the author have conducted at Cornell and also in other investigations. This is apparently because the bacteria in the rumen, or paunch, make good-quality protein from other sources of nitrogen, and farther on in the digestive tract, the ruminant digests the bacteria and gets a meal of good protein.

In addition to our metabolism experiments, which have been with growing lambs, we have conducted practical feeding experiments with dairy cows, with fattening steers, and with fattening lambs to determine whether the quality of protein in the concentrate mixture, or grain mixture, was of any importance for these classes of stock when there was little or no legume forage in the ration.

Five experiments with dairy cows have been completed in each of which one group of cows was fed a simple grain mixture consisting of ground corn, ground oats, corn gluten feed, and corn gluten meal, which would supply poor-quality protein for non ruminants. Another group was fed a mixture supplying better protein and more variety. This contained not only ground corn, ground oats, and corn gluten feed, but also soybean oil meal, linseed meal, cottonseed meal, and corn distillers' dried grains. In the last two trials 5 per cent of cane molasses were included in each mixture. For roughage the cows had corn silage and mixed hay low in legumes. These experiments were conducted by Doctor R. W. Bratton (now Lieutenant), Professor G. W. Salisbury, and the author.

On the average, the cows fed the higher-quality-protein grain mixture produced 36.93 pounds

of 4 per cent fat-corrected milk a day, in comparison with 36.55 pounds for the other ration. This small difference of only 0.38 pounds milk was not significant. In two of the experiments, the yield was higher on the low-quality-protein mixture, in two experiments it was higher on the high-quality-protein mixture, and in the other trial there was no difference. There were also no significant differences in the health or the maintenance of live-weight on the two rations.

These experiments, with a total of 86 lactations, show clearly that the kind or quality of protein is of little practical importance in any ordinary grain mixture for dairy cows, even when but little of the roughage is legume forage. This means that, in making up a grain mixture for dairy cows, one can use whatever protein supplements are available, so long as the mixture is palatable to the cows and made up of satisfactory feeds for milk production.

Earlier Marketing of Range Cows

Condensed from The Cattleman

Leon C. Hurtt
Northern Rocky Mountain Forest and Range Experiment Station, Missoula, Montana

ON most cattle ranches, it is the regular practice to cull the breeding herd and to market the older and less desirable cows each year. The usual practice on Northern Great Plains ranges has been to gather and market these culled animals in October or late September. Cows that have failed to raise a calf one or more seasons usually make up a substantial part of the breeding animals that are culled for market each fall.

If these cows were marketed earlier in the season, it is obvious that more range forage would be available for the remainder of the herd. Any such saving of range forage will, in turn, tend to shorten the winter feeding period and reduce the expense and risk of wintering the remainder of the herd. It thus becomes a matter of importance in managing the range and other feed resources to market the culled cows as early as possible without corresponding sacrifice in weight or in price.

The trend in weight of dry cows and cows with calves on experimental cattle pastures on short-grass range near Miles City, Montana, provides some basis for deciding on the relative merits of fall versus late summer marketing

Reprinted by permission from The Cattleman, Texas

of range cows. This co-operative experiment, conducted by the Forest Service in co-operation with the Montana State Agricultural Experiment Station and the Bureau of Animal Industry at the U. S. Range Livestock Experiment Station near Miles City, Montana, was set up at the U. S. Range Livestock Experiment Station to determine over a period of years the relative merits of heavy, moderate, and light degrees of range stocking by 20 breeding cows at each degree of stocking and of certain other range management practices. Weight trends of the cows on the various summer pastures provide information of interest on the question of which is the preferable marketing time.

These high quality Hereford cows and their calves were grazed during the summers from 1933 to 1941 on a series of adjacent short-grass range pastures. The first group of 60 cows were started as 3-year-olds with their first calves in 1933 and continued during four seasons. The second group of 60 cows grazed on the same pastures as 3-year-olds with their first calves in 1938 and summer weight data through 1941 are now available. The eight seasons embrace the severe drouth years of 1934 and 1936 and six more normal seasons. These cows were turned into the summer pastures on or about May 15 and remained there until about mid-November, when they were moved back to winter pastures. During these summer periods, the cows and their calves were weighed individually at 28-day intervals. The number of dry cows out of 60 varied from 4 in 1939 to 18 in 1935.

Dry cows, as well as cows with suckling calves, gained rapidly from mid-May until early July except during two severe drouth years. During July and August, the cows with suckling calves usually lost some weight even though they had an ample supply of nutritious forage to last until November. After early September the trend was definitely downward for these "wet" cows. During 1934 and 1936, which were severe drouth years, the average peak weight for wet cows was recorded on June 12 from which point weight dropped rapidly as the forage became scarce.

Average weight trends of dry cows followed a somewhat similar course, but trended upwards more sharply through May and June. During six relatively favorable seasons, average gains for dry cows of 115 to 182 pounds for the first 56 days or at the rate of 2.0 to 3.2 pounds per day were made during this spring period.

Weight gains for dry cows during the second 56-day period —from early July to early Sep-

tember—were at a much lower rate, ranging from 0.1 to 1.3 pounds per day, or an average for all dry cows for six normal years of 0.54 pound per day.

Forage was relatively abundant in all pastures during this second 56-day period. Reduced gains were therefore not due to scarcity of forage, but rather to flies, hot weather, and perhaps mostly to a change in quality of the range forage from the green and succulent stage to the cured stage. Succulent green grass is rich in proteins, vitamins, and minerals, is easily digested by livestock, and such feed is considered by feeding authorities as a watered concentrate because it is so healthful and nutritious. It is a well-established fact that such green forage produces livestock gains at a more rapid rate than when the forage has reached the mature stage, such as usually occurs during this second period in July and August.

The third period of 56 days on summer pastures extended from the first few days of September to the last few days of October—usually from September 4 to October 30—but in 1939 it embraced the period from August 24 to October 19. During this third period, the supply of range forage became limited, more so for cows on heavily stocked than those on moderately or lightly stocked pastures.

Following is the record of average gains and losses for dry cows during this third 56-day period for six relatively favorable forage years. The heavily, moderately, and lightly grazed pastures were represented by an aggregate of 24, 17, and 17 dry cows, respectively, during these six years.

1933—6 dry cows *gained* an average of 10 pounds.

1935—18 dry cows *lost* an average of 45 pounds.

1938—10 dry cows *lost* an average of 28 pounds.

1939—4 dry cows *gained* an average of 14 pounds.

1940—14 dry cows *lost* an average of 39 pounds.

1941—6 dry cows *gained* an average of 16 pounds.

Average weight losses occurred during three seasons, but slight gains also occurred during three seasons. Losses averaged more than double the gains to give a combined downward weight trend during this early fall period. This downward trend was more pronounced during October than September. During this period dry cows were merely "free boarders" even though slight gains were made during October of one year, but not enough to pay for the extra time, cost, and risks involved. Weight losses averaged still heavier during early November. This brings into sharp focus the question as to whether dry cows should be sold

in late August or early September rather than two months later, when on the average they weigh substantially less.

Weight trends for the cows (5-year-olds) in the 1940 season are quite similar to trends during the five other relatively normal years.

Relative prices and shrinkage in August or in early September sales, as well as the weight trend and supply of cheap range forage, of course, deserve some consideration in reaching a conclusion as to early versus late marketing of dry cows. Bulletin No. 394 of the Montana Agricultural Experiment Station reports that average prices for beef on Montana ranches are somewhat lower in September, October, and November than in July or August. It is evident that the late October price would have to be substantially higher to compensate for the average loss of 39 pounds on dry cows between September 4 and October 30, 1940, or 45 pounds in 1935.

Specific data are not available from this experiment to show relative weight shrinkage of dry cows shipped in early September as compared to shrinkage two months later. It is known, however, that such short-grass forage usually becomes dormant in July or early August and continues in this condition for several weeks. Green growth occasionally occurs in the fall when September rains provide sufficient moisture, as was the case in 1940 and 1941. It is reasonable to believe that shrinkage of range cattle shipped in October from green, washy grass may often be equal to or greater than the shrinkage when shipped in late August or early September from mature forage.

Regardless of relative shrinkage and even of some slight weight gains that are sometimes made in September, the amount of range forage used by dry cows during this 60-day period is often badly needed and may be used to better advantage for wintering the breeding herd that is to be maintained. A delay of 60 days or more in marketing the culled cows may mean substituting for cheap range forage a corresponding amount of hay or supplemental feed, thereby greatly increasing the cost of wintering the breeding herd. The cost of hay is usually 5 to 10 times greater than the cost of range forage for an equal period of time. Furthermore, heavy grazing may result in damage to the range. The extra feed required for carrying the dry cows for 60 days after early September must be balanced against wintering cost of the remaining herd and the risks involved in a severe winter. All deserve consideration in deciding on an early or late date for marketing dry range cows during a favorable season. During a

drouth season, marketing in July may be unescapable.

So far this discussion has been mainly about dry cows. Some wet cows are normally culled and included in sales each fall. To what extent is earlier marketing of cows with suckling calves desirable? Of six relatively normal years, cows with calves reached maximum average weights in August during three years, in early September in two years, and on July 10 during one year. Trends after early September each year were quite similar to those for wet cows for 1940. During the two drouth years, the cows with calves averaged heaviest on June 12 and declined rapidly in weight thereafter until hay feeding became necessary in July.

Even though weight losses for those wet cows were more severe after late summer than for dry cows, it is not always advisable to wean the calf and sell the cow in early September. Early marketing of such wet cows may well be justified if the calf is six months old or more and ready to be weaned. Also, young suckling calves may often be marketed separately as vealers at a very favorable price. Early marketing of cows having calves classed as vealers, as well as those having well-developed calves that are old enough to be weaned, may be well justified. A threatened shortage of range forage may justify the early marketing of a considerable portion of the less desirable wet cows.

Weight trends for yearling range steers in another experiment, conducted during the spring and summer of 1939 to 1942, indicate that this class of cattle normally gain at the rate of 2 to 2½ pounds per day during May and June when the grass is abundant, green, and succulent, but at less than half this rate in late July and August when they had an ample quantity of mature but rather dry grass. Unfortunately, weight data for these steers through fall months are not available to show whether their average fall weight trend was closely similar to dry cows. However, when the supply of range forage is so limited as to reduce the rate of gains on mature forage during late summer to a very low figure, it may sometimes be advisable to market range steers as well as cows by early September. Such a practice may be especially desirable during a dry year, or when grasshoppers use a large percentage of the forage. Any material change to an earlier marketing of steers should be made gradually and only after full consideration of the effect on feeding operations in the "Corn Belt" and elsewhere.

Weight losses usually exceeded gains for both dry cows and cows with calves after late August or

early September even during favorable seasons on typical short-grass ranges near Miles City. In view of this rather well-defined trend, coupled with a downward trend in ranch beef prices on the average from July through the fall months, it is evident that dry cows and some wet cows may often be marketed to better advantage in late August or early September rather than late in October. If shrinkage proves to be less or even equal when cattle are shipped at these early rather than later dates, the advantages of heavier weight and higher prices at earlier dates will be increased.

It should not be overlooked, however, that the advantages of greater immediate returns may often be of minor importance as compared to the saving in the cost of wintering the breeding herd that may be made when those sold are marketed early. This is a very important item during normal years, but during drouth years very early marketing is of supreme importance because it may determine whether the breeding herd may be carried through to another year without prohibitive costs or severe losses.

Early marketing of cows allows for a more economical use of expensive hay or other stored feed on the one hand, and a more efficient use of cheap range forage that will on the other tend to keep down production costs and risks of losses in the breeding herd.

Stabilized Big Gully

A gully on the Charles Troester place, Clayton County, Iowa, was growing at an alarming rate. It was 400 feet long, and still eating back. Maximum depth was 15 feet, and it ranged from 30 to 40 feet wide. Something had to be done. He ran a diversion ditch around the head of it to keep water out, then pushed in the shoulders so the banks could be bladed in to round out the bottom. A mixture of bluegrass, timothy, redtop and alsike was seeded to hold the soil. This mixture took hold, and in two years a dense, solid sod had formed. That, and a wide, flat bottom have stopped all wash. The area will be used as hay meadow. In Winneshiek County, Iowa, Leo L. Birdsell and Ralph Birdsell, brother-partners, used a diversion dike to turn water out of a gully, then planted it to black locusts to stabilize it.

—*Capper's Farmer*

FOR THE FARMER'S LIBRARY

These books are recommended as outstanding in their field:

Animal Sanitation and Disease Control—By Dr. R. R. Dykstra, Dean of the School of Veterinary Medicine, Kansas State College. The Interstate Printers and Publishers. $2.85.

Beef Cattle — By Roscoe R. Snapp, Asso. Prof. Animal Husbandry, Univ. of Illinois. John Wiley & Sons, Inc. $4.00.

Beef Cattle Production in the South—By D. W. Williams, Head, Department of Animal Husbandry, A. & M. College of Texas, College Station, Texas. The Interstate Printers & Publishers (1941). $2.00.

Beekeeping — By Everett Franklin Phillips, Professor of Apiculture, Cornell University. The Macmillan Co. $4.00.

Breeding Your Own, or Raising Colts for Pleasure and Profit — By Clarence E. Bosworth. The Derrydale Press ($10.00). A book suitable for the breeders of hunters' and saddle horses.

Dairy Cattle and Milk Production—By Clarence H. Eckles, B.S.A., D.Sc., late Chief, Div. of Dairy Husbandry, Univ. of Minnesota. The Macmillan Co. $3.90.

Dairy Science—By W. E. Petersen, Ph.D., Assoc. Prof. and Assoc. Dairy Husbandryman, Univ. of Minn. Edited by R. W. Gregory. J. B. Lippincott Company (1939). $4.00.

Farm Accounting—By Donald R. Mitchell, Asst. Prof. Agri. Economics, Univ. of Wisc. McGraw-Hill Book Co., Inc. (1941). $2.50.

Farm Shop Practice—By Mack M. Jones, M.S., Prof. Agri. Engineering, Univ. of Mo. McGraw-Hill Book Co., Inc. $2.75.

Feeds and Feeding—By F. B. Morrison, Prof. of Animal Husbandry and Animal Nutrition, Cornell Univ. Morrison Press. $5.00.

Farm Meats—By M. D. Helser, B.S.A., M.S., Prof. Animal Husbandry, Iowa State College. The Macmillan Co. $2.90.

Farm Management—By Robert R. Hudelson. The Macmillan Co. $2.00.

Farm Management and Marketing—By V. B. Hart, Ext. Professor of Farm Management; M. C. Bond, Ext. Professor of Marketing; L. C. Cunningham, Ext. Asso. Professor of Farm Management; all of N. Y. State College of Agriculture, Cornell University. Publishers: John Wiley & Sons, Inc. (1942). $2.75.

Forestry in Farm Management—By R. H. Westveld and Ralph H. Peck. John Wiley & Sons, Inc. (1941). $3.00.

Grow Your Own Fruit—By M. G. Kains, formerly with U. S. Dept. of Agriculture; Professor of Horticulture, Pennsylvania State College. Charles Scribner's Sons. $3.50.

Hunger Signs in Crops—Published by the American Society of Agronomy and The National Fertilizer Association. $2.50.

Home Vegetable Gardening—By Charles S. Nissley, Extension Horticulturist in Vegetable Growing. Rutgers Univ. Press (1942). $1.50.

Judging Dairy Cattle—By Edwin S. Harrison, Professor of Animal Husbandry, Cornell University. John Wiley and Sons, Inc. $2.75.

Livestock Judging Handbook—By Julius E. Nordby, Asst. Prof. Animal Husb., Univ. Idaho, and W. Malcolm Beeson, Ph.D., Asst. Prof. Animal Husb., Univ. Idaho. The Interstate Printers. $2.60.

Livestock Production—By Walter H. Peters, Chief of the Division of Animal and Poultry Husbandry, Univ. of Minn. McGraw-Hill Book Co., Inc. $3.50.

Poultry Husbandry—By Morley A. Jull, Prof. of Poultry Husbandry, Univ. of Maryland. McGraw-Hill Book Co., Inc. $4.00.

Poultry—By A. R. Winter, Asst. Prof. Poultry Husbandry, Ohio State Univ., and E. M. Funk, Asst. Prof. Poultry Husbandry, Mo. State Univ. J. B. Lippincott Co. $5.00.

Pork Production—By William W. Smith, Prof. of Animal Husbandry, Purdue Univ. The Macmillan Co. $3.75.

Practical Poultry Management—By James E. Rice, Emeritus Professor of Poultry Husbandry, and Harold E. Botsford, Extension Professor of Poultry Husbandry, both at New York State College of Agriculture. Fourth Edition (1940), John Wiley & Sons, Inc. $2.75.

Practical Horse Breeding and Training — By Jack Widmer. Charles Scribner's Sons (1942). $3.00.

Repairing Farm Machinery—By Ivan G. Morrison, Asst. Professor Agri. Education, Purdue University. The Interstate Printers & Publishers. $1.80.

Sheep Production—By Levi Jackson Horlacher, B.S.A., M.A., Asst. to Dean, Col. Ag. Univ. Ky. McGraw-Hill Book Co., Inc. $4.00.

Sheep—By Levi Jackson Horlacher, Prof. of Animal Husbandry, Univ. of Kentucky. The Interstate Printers and Publishers. $2.00.

Soil Conservation — By Hugh Hammond Bennett, Chief, Soil Conservation Service, U. S. Department of Agriculture. McGraw-Hill Book Company, Inc. $6.00.

Some Common Diseases of the Horse—By George R. Conn, B.S.A.H., D.V.M., Orange Judd Publishing Co., Inc. (1942). $1.50.

Some Common Diseases of Cattle—By George R. Conn, B.S.A.H., D.V.M. Orange Judd Publishing Co., Inc. (1942). $1.50.

Soybeans—Gold from the Soil — By Edward Jerome Dies. The Macmillan Co. $1.75.

The Western Horse—Its Training, Type and Marketing. By John A. Gorman, Asso. Prof. Animal Production, Univ. of Wyoming. The Interstate Printers and Publishers. $1.65.

The Farm Primer—By Walter Magnes Teller, formerly with the Farm Security Administration, U. S. D. A. David McKay Co. $2.50.

Vegetable Crops — By Homer C. Thompson, Ph.D., Prof. Veg. Crops, Cornell Univ. McGraw-Hill Book Co., Inc. $5.00.

BOOK NOTES

GARDENING FOR GOOD EATING — By Helen Morgenthau Fox, gardener and author.

This is a most valuable book in these days of stress when it is a patriotic duty as well as a pleasure to raise at least some of one's own vegetables. Mrs. Fox offers information of value to the workers in the earth and those in the kitchen in chapters on planning, sowing, and cultivation of the vegetable garden; it includes many delectable recipes, and tells how to preserve and store the winter supply.

Publishers: The Macmillan Co. $2.50.

For the convenience of our readers, books listed may be purchased through this Department. Address Farmers Digest, Ambler, Pa.

INDEX

Beef Cattle

Lower Beef Costs ..... May, 1942
Fitting Steers for Show ..... May, 1942
Why Creep Feed Calves? ..... June, 1942
Figuring the Farm's Beef Power ..... July, 1942
Let Performance Be Your Beef Guide, Aug.-Sept., 1942
What War Means to the Cattle Feeder, Oct., 1942
Proving Beef Sires ..... Oct., 1942
Easier Cattle Feeding ..... Nov., 1942
Short-fed Cattle Mean More Profit ..... Nov., 1942
Profit or Loss in the Cattle Business ..... Jan., 1943
Cattle Hides ..... Jan., 1943
With Emphasis on Roughage ..... Feb., 1943
America's Meat Power Develops ..... Feb., 1943
Beef Production Can Be Stepped Up ..... May, 1943
Range Management ..... May, 1943

Conservation

The Land and the People ..... Nov., 1941
An Anthology ..... May, 1942
Fence Row Facts ..... June, 1942
Conservation Farming and Yields ..... July, 1942
A Piece of Land ..... Aug.-Sept., 1942
Plow Method of Terrace Construction, Oct., 1942
Conserve for Production ..... Nov., 1942
Nutrient Quality of the Soil ..... Jan., 1943
Halt Stream Bank Erosion ..... Jan., 1943
Our Soils in Selective Service ..... May, 1943

Crops

Brome Grass ..... Nov., 1941
Piper Velvet Bent ..... Nov., 1941
Little Beans—Big Business ..... Dec., 1941
New System Farmer ..... Dec., 1941
New Control for Corn Ear Worms ..... Dec., 1941
High Cotton Yields ..... Jan., 1942
Crop Insurance Dollars ..... Feb., 1942
Cotton Grown to Measure ..... Feb., 1942
Modern Rain Makers ..... April, 1942
Kudzu—Mender of Tattered Lands, April, 1942
Mystery Fiber Produced in Florida ..... April, 1942
Seed Treatment for Cereals and Corn, May, 1942
Which Forage Crops? ..... June, 1942
Fertilizing Corn ..... June, 1942
More Flax ..... June, 1942
New Crop for the South ..... June, 1942
Sudan Grass ..... June, 1942
Extending the Life of Clover Stands, Aug.-Sept., 1942
Start Alfalfa in August ..... Aug.-Sept., 1942
Bromegrass ..... Nov., 1942
100 Bushels of Corn on Old Land ..... Jan., 1943
Hemp—Our Forgotten Crop ..... Jan., 1943
Copra ..... Jan., 1943
Use Legumes in Seeding Mixtures ..... April, 1943
Tobacco Plant-bed Management ..... May, 1943

Dairy Cattle

Artificial Udder Growth ..... June, 1942
Vitamin C for Sterility ..... June, 1942
Frequency of Milking and Production, June, 1942
Ten Calves per Year from One Cow ..... July, 1942
Heavier Grain Feeding to Increase Milk, July, 1942
Birth Control in the Cow Barn ..... Aug.-Sept., 1942
Barn Slaves Revolt ..... Aug.-Sept., 1
New Methods in Dairy Cattle Feeding, Aug.-Sept., 1
Experiences in Breeding ..... Aug.-Sept., 1
Care of Milking Machines ..... Aug.-Sept., 1
Breeding Goats for Winter Milk, Aug.-Sept., 1
Why Do Cattle Bloat? ..... Aug.-Sept., 1
White Scours ..... Oct., 1
Milking Machine Put on Time Schedule, Oct., 1
Grazing Habits of Cows ..... Oct., 1
Milk Production of Cows ..... Oct., 1
The Udder and Mastitis ..... Nov., 1
Building a Foundation Herd ..... Nov., 1
Feeding Vitamin A to Dairy Cows ..... Nov., 1
Influence of High Fat Intake ..... Nov., 1
Better Breeding Reduces Milk Costs ..... Jan., 1
Milking Machine Sanitation ..... Jan., 1
Proteins, Minerals, Vitamins for Reproduction ..... Jan., 1
Sweet Clover in Texas ..... Feb., 1
New Hormone Works Wonders ..... Feb., 1
Water and Your Dairy Cattle ..... Feb., 1
More Milkings—More Milk ..... April, 1
Milking Machines—Washing and Care, April, 1
Selecting the Young Herd Sire ..... May, 1
Timed Milking Saves Labor ..... May, 1
Nicking in Dairy Cattle Breeding ..... May, 1

Farm Machinery

Portable Lumber Harvester ..... Oct., 1
You Can Ventilate That Stable ..... Jan., 1
Tooling Up for Soil Conservation ..... Jan., 1
Speed in Farming ..... Jan., 1
Bale-Chute Saves Labor ..... Jan., 1
Farm Machinery in 1942 ..... Mar., 1
The Most from a Gallon of Gas ..... Mar., 1
Push Button Barn Cleaning ..... Mar., 1
How to Make the Mower Work Better, June, 1
Device Saves Baling Wire ..... June, 1
Good Tractor Care ..... June, 1
New Methods Save Labor in Haying, July, 1
The Sweep Rake ..... July, 1
Cutting Labor Corners ..... July, 1
What Shall I Charge ..... July, 1
Tractors in Wartime ..... Aug.-Sept., 1
Farm Machines Fight for America ..... Jan., 1
Take Care of Your Machinery ..... Jan., 1

Fruit

What Do Apples Cost? ..... March, 1
4-Leaf Clover System of Pruning ..... March, 1
Date Growing ..... April, 1
The Papaya in Florida ..... May, 1
Soil Management in Orchards ..... June, 1
The Carob Tree ..... July, 1
Growing and Drying Prunes Aug.-1
New Spray for Apples ..... Dec., 1
Modifying Biennial Bearing in Apples, Jan., 1
Planning a Nut Orchard ..... Jan., 1
Is Your Sprayer Ready ..... Feb., 1
Economy in Pruning ..... Mar., 1
Cover Crop Problems in Orchards ..... July, 1
Pruning Abandoned Fruit Trees ..... Jan., 1
Pruning Peach Trees for Production ..... Feb., 1
Trends in Fertilizing Apple Orchards, May, 1

INDEX

...Nov., 1941
...Bearing vs. Neutral Fertilisers, Dec., 1941
...the Calcium—Not the Alkalinity, Mar., 1942
...ving for Permanent Hay.....July, 1942
...ure Will Help .....July, 1942
...Becomes Part of Soil.....Oct., 1942
...ure Yields Profits .....Jan., 1943
...ing Fertilizer in Its Place.....Feb., 1943

...t Ways of Making Hay .....June, 1942
...Cutting Time Vital .....July, 1942
...y in Grasses for Pasture and Hay, April, 1943
...Legumes and Grasses .....May, 1943

...Pregnancy Test .....Mar., 1942
...Progress .....April, 1942
...on Supplements for Hogs....April, 1942
...Pig Disease .....May, 1942
...tion Testing for Hogs .....June, 1942
...in 8 in Swine Nutrition....July, 1942
...g the Show Herd .....Aug.-Sept., 1942
...of Performance for Swine...Oct., 1942
...Hogs Heavy for More Profit..Oct., 1942
...Against Soft Pork.....Oct., 1942
...Hog Cholera Vaccine .....Nov., 1942
...on Concrete .....Nov., 1942
...thing New in Pigs .....Nov., 1942
...ew Herd in Winter.....Feb., 1943
...Them off to a Flying Start ...April, 1943
...tion Testing as a Basis for Selection, April, 1943
...Lot Strategy .....May, 1943
...Erysipelas .....May, 1943

...ount Service Breeding Plan ..April, 1942
...h Out for It .....May, 1942
...of the Horse .....June, 1942
...Horses of the Plains.....July, 1942
...of the Brood Mare.....Aug.-Sept., 1942
...erative Selling .....Aug.-Sept., 1942
...of Good Roughage for Horses..Oct., 1942
...and Mules .....Jan., 1943
...ing and Shoes .....Feb., 1943
...ing Horses .....Feb., 1943

...Pasture That Does Not Take Annual ...Feb., 1942
...s is Money .....Feb., 1942
...ture Champions .....Mar., 1942
...Search for Better Grass.....Mar., 1942
...d Pasture Management Pays..April, 1942
...d Pasture Returns Dividends...May, 1942
...ning the Use of Pasture .....June, 1942
...nation Legumes for Grazing, Aug.-Sept., 1942
...s Varieties to Improve Western Range, Oct., 1942
...Browse in Grass .....Jan., 1943
...ver Pastures for the Coastal Plains, Jan., 1943
...ment Pastures in the South..Feb., 1943
...Cafeteria and New Grasses...April, 1943
...rrigation of Pastures.....May, 1943
...er Like Lespedeza .....May, 1943

Poultry

R.O.P. and the Progeny Test .....April, 1942
New Facts on Cannibalism .....May, 1942
Finding Substitutes .....May, 1942
Better Quality Eggs .....June, 1942
Dried Eggs .....June, 1942
Profitable Air Conditioning.....July, 1942
Getting Summer Eggs.....July, 1942
Chickens on Shares .....July, 1942
Sulfur and Charcoal Prevent Coccidiosis, July, 1942
How Much Did Those Pullets Cost? Aug.-Sept., 1942
Chicks Out-of-Season .....Aug.-Sept., 1942
Store Eggs for Lean Months..Aug.-Sept., 1942
All Out Production from the Pullets..Oct., 1942
The Trask Plan .....Oct., 1942
Fall Chicks .....Nov., 1942
Cull Your Hens All the Time.....Nov., 1942
A Boom in Feathers .....Nov., 1942
Finishing Turkeys for Market.....Nov., 1942
A Little More Room, Please.....Nov., 1942
Goose Raising .....Nov., 1942
A Triumph for Turkey Tenancy....Jan., 1943
More Chicks per Hen .....Jan., 1943
Reduced Feed Costs for Poultry...Feb., 1943
New Feeds and Feeding Methods...Feb., 1943
Do You Have a Halfway Flock?...April, 1943
Electric Brooder Care .....April, 1943
Broilers Grown in Greenhouse.....May, 1943
Foolproof Hen Feeding .....May, 1943
Raising and Marketing Squabs.....May, 1943
Turkey Flock Nets $3.12 Per Bird..May, 1943

Sheep

Box-Type Lamb Brooder .....Mar., 1942
Sheep Production Programs .....April, 1942
Self-feeding of Fattening Lambs ..May, 1942
How Much Roughage for Sheep? ..June, 1942
A Production Test for Sheep.....July, 1942
Flying Sheepskins .....Aug.-Sept., 1942
Commercial Lamb Feeding...Aug.-Sept., 1942
More Profit from Sheep on Range..Jan., 1943
Maintaining the Farm Flock.....Jan., 1943
A Sheep Feeder Checks on Supplements, Feb., 1943
Suggestions for Southern Sheepmen..April, 1943
It Will Save the Lambs.....April, 1943

Silage

Storing Grass Silage .....Feb., 1941
Place of Grass Silage .....March, 1941
Sweet Clover Silage .....June, 1941
New Methods for Grass Silage....Sept., 1941

Rabbits

The Family Rabbitry .....April, 1943
Domestic Rabbits for Home Consumption, May, 1943

Vegetables

High Quality Celery .....July, 1941
More Lime for Vegetables .....Dec., 1941
Growing Winter Rhubarb .....Feb., 1942
Tenants Share Garden .....Feb., 1942
What's New in Vegetables for 1942..Mar., 1942
How a Champion Grows Tomatoes..April, 1942
Fertilizing for Better Vegetables...May, 1942
Should Potatoes Be Planted Thick or Thin?, May, 1942
Using Blitzkrieg on Weeds ..Aug.-Sept., 1942
Growth Regulations for Celery.....Feb., 1943
Something New in Plant Growing..April, 1943
The Good Acre .....May, 1943
Plan to Dry, Store and Can.....May, 1943

The Farmer's Digest

EDITORIAL STAFF:

Editor—L. Bush-Brown Assistant Editor—C. Leavitt Dyer

Business Manager—A. E. Heick

Associate Editors—
John A. Andrew, Jr., James Bush-Brown, Ruth Patrick

ADVISORY EDITORIAL STAFF:

William A. Albrecht
Chairman, Department of Soils
University of Missouri

John D. Beck
Professor of Veterinary Medicine
University of Pennsylvania

Hugh H. Bennett
Chief, U. S. Soil Conservation Service

D. B. Johnstone-Wallace
Assistant Professor, Department of Agronomy
Cornell University

H. J. Reed
Dean of the College of Agriculture
Director of the Experiment Station
Purdue University

W. T. Spanton
Chief, Agricultural Education Service
U. S. Office of Education

Howard B. Sprague
New Jersey Agricultural Experiment Station

M. L. Wilson
Director of Extension Work
United States Department of Agriculture

The Farmer's Digest

Published Monthly at Ambler, Pennsylvania
by the Farmer's Digest, Inc.

25c a Copy *1 Year $2.00*

2 Years $3.50 *3 Years $5.00*

Foreign and Canadian Subscriptions $2.50 a Year

Entered as second-class matter at the Post Office at Ambler, Pa., May 5, 1937, under act of March 3, 1879